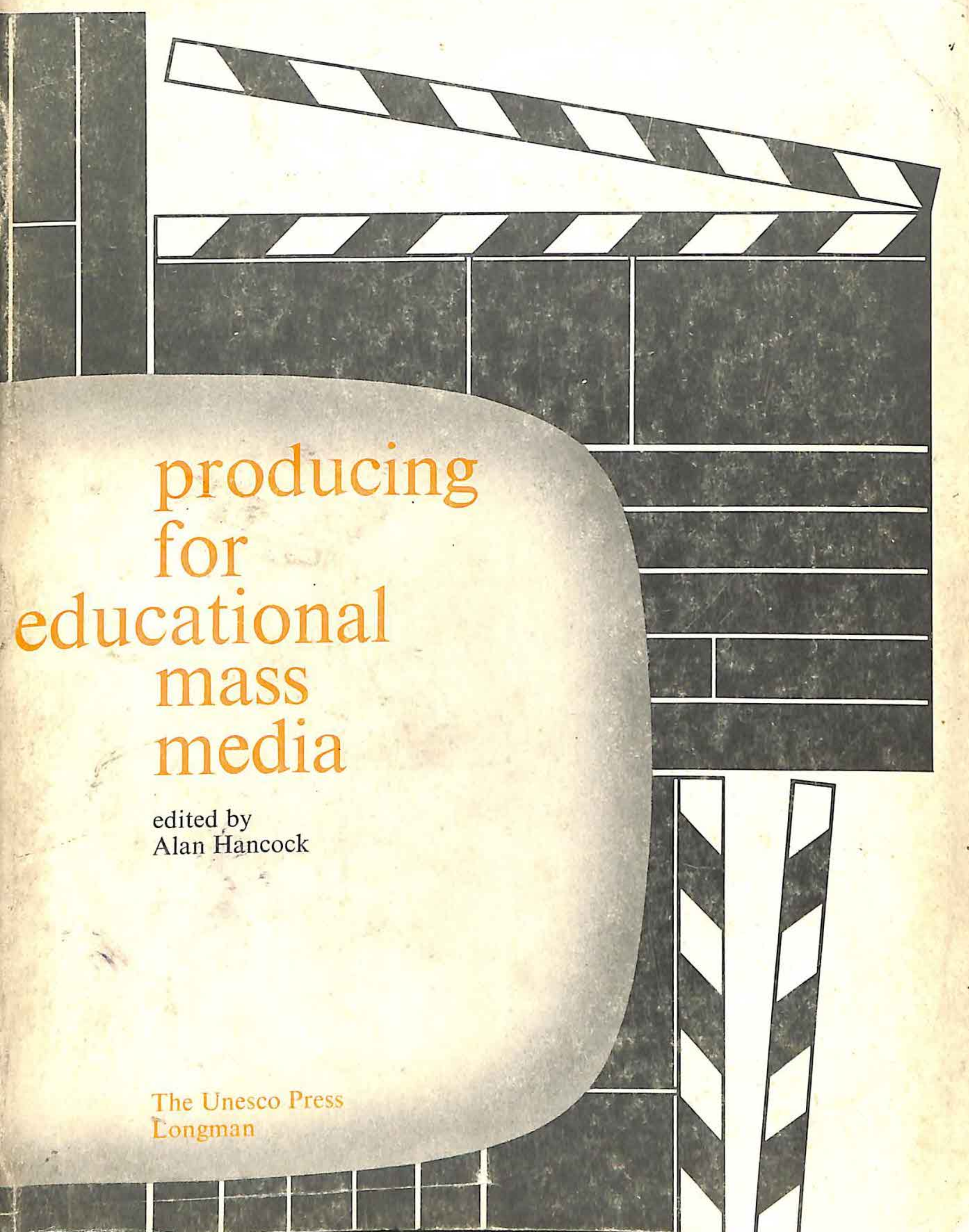

producing for educational mass media

edited by
Alan Hancock

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Producing for educational mass media

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Edited by
Alan Hancock

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Preface

This book is designed as a practical manual for producers and would-be producers of educational media programmes. It is primarily concerned with television, but in view of the growing importance of multi-media systems, and the need for producers to be conversant with a number of formats, sections are also included on radio and supporting print and audio-visual media. The handbook surveys a wide range of audiences and subjects, at both in-school and out-of-school levels. While the principles and practices which it describes are general, the main emphasis is upon programming for producers in developing countries, in situations where media are being deployed within a significant programme of educational development, reform and innovation.

The book illustrates methods of production planning and organization, studio and film techniques, relations with performers, and the problems and potential of specific subject areas and audiences. It is the work of a number of specialists, who collectively have a considerable experience of the field, in a variety of environments. No attempt is made to cover those details of production which can be found in the numerous books on television technique already in existence, except when a general résumé of production craft is needed, to retain continuity, or when some initiation if offered to a new fild (like colour television or community media). The main purpose has been to include information, advice and techniques which are particularly relevant to the educational media practitioner. He is in a somewhat different category from his counterpart in the general media field; his work derives from the same principles, but different demands are made upon him, to meet specific educational situations.

For this reason, the authors have been concerned, while concentrating upon the production process, to put the work of the educational media producer into a wider context. The producer is not acting alone; he is part of a complex network, and his work is valid only through its relevance to the demands of educational planning, curriculum development, teacher training, utilization and evaluation. His effectiveness therefore depends upon an understanding of his relationship to the total system. For him creativity is essential, as with all aspects of media, but it must always flow from a context of use. The successful producer of educational media is several people contained in a single personality: educator, artist, planner and technician.

Contents

Introduction **The producer and his environment** 11
Alan Hancock

Part I **Producing for educational television**

Introduction 23

Chapter 1 **The production team** 27
Alan Hancock

Chapter 2 **Production phasing and budgeting** 33
Alan Hancock
The programme outline 33
Programme preparation 35
Budgeting 36
Resource materials 40
Production 40
Piloting 41

Chapter 3 **Script-writing and performing** 43
Alan Hancock,
Tan See Lai
Scripting 43
Artists and performers 43

Chapter 4 **Graphics and design** 49
Beverley Clarke
Constraints of the medium 49
Studio displays 50
Basic principles of layout 53

Animation and special effects 58
Photography 61
Studio design 62
Designing for colour 64

Chapter 5 **Technical principles** 67
Douglas Grant,
Jack Moore
Technical planning personnel 67
Engineering and equipment 67
Small-format technology 72
Colour television 75

Chapter 6 **Technical operations** 77
Harry Myers,
Pat Alexander, Barry Sloane
The planning meeting 77
Camera operations 77
Vision mixing 81
Audio operations 84
Lighting operations 88
Technical operations for colour television 100

Chapter 7 **Filming** 105
Alan Guley,
John Halas
Uses of film 105
The shooting script 106
The filming process 107
Processing 114
Editing 115
The final stages 115
Filming in colour 117
Film animation 118

Chapter 8 **Production and recording** 129
Alan Hancock,
Harry Myers, Tan See Lai
Outside rehearsal 129
The camera script 131
Studio production 141
Camera rehearsal 141
Recording and editing 146

Part II Producing for other media

Introduction 151

Chapter 9 **Educational radio** 153
Brian Kent,
Frances Berrigan
The texture of sounds 153
Sound effects 155
Microphone technique 157
Programme formats 160
Studio production 164
Actuality recording and editing 166

Chapter 10 **Audio-visual and print media** 171
George Klein,
Josephine Hickey
Functions of support media 171
Audio-visual materials 172
Radio vision 174
Print media 175

Part III Special problem areas

Introduction 185

Chapter 11 **Science and mathematics programmes** 187
Edward Goldwyn,
Peter Dye, Paul Seow
Creativity 187
The producer 188
The script 190
Programme production 191
Studio techniques 194

Chapter 12 **Language teaching by television** 199
Jean Dawes,
Carol Wiseman
Language teaching in the school 199
The planning stage 200
The production stage 201
The direction stage 207
Language teaching for adults 209

Chapter 13 **The use of drama in television** 213
Carol Wiseman
Functions of drama 213
Specific programme areas 214
Production techniques 217

Chapter 14 **Current affair sand documentary programmes** 221
John Miller

Chapter 15 **Closed-circuit television** 227
Hugh Williams,
George Klein, Peter Coltman,
Functions of closed-circuit television 227
Planning for CCTV 229
Some case studies 231

Chapter 16 **Community media** 241
Frances Berrigan
What are community media? 241
Radio 242
Television 248

Conclusion 257

Notes on contributors 259

Introduction

The producer and his environment

Alan Hancock

Even as it was being written, this book was changing. This is not unusual in itself; most authors refine and re-order their thoughts as they are putting pen to paper. But the changes in this handbook were of a different order, because they reflect parallel changes in thinking about the function of educational media, and consequently in the role of the media producer. Only a few years ago, separate books might well have been written for the radio producer, the television producer, the producer of print and audio-visual materials. Today, even though producers still generally work in one or the other medium, it is their relationship to other disciplines, and to the total educational process, which is emphasized. Today our attitude to educational media is much more restrained, more disciplined and more thoughtful than hitherto; experience (and a good deal of failure) has forced media planners to look more carefully at the rationale for their existence, and to come up with more guarded answers. The days are past when educational television (ETV) was seen as a panacea for all ills; now media are accepted as one more tool available for educational development, answering different purposes in different situations.

In consequence, the educational media producer is not so often seen as a purely creative worker, set apart by his talent in the traditional fashion of the artist. He is forced to learn and think more about the work of colleagues, because what they do is fundamental to his craft. He is not simply required to make good or exciting programmes (though they must be both good and exciting, otherwise audiences will not wish to view them), but they must also be relevant to the educational process of which they are a part.

In this handbook, therefore, while the main stress is upon the craft of the producer, his relationship to complementary processes, and to other members of the educational team, is constantly stressed. He has to be sympathetic towards, and tolerably well versed in, many other disciplines beyond his own: those of the curriculum developer, of the evaluator and research worker, of the technologist and of the engineer.

The reason for this new situation lies, not so much with changes in the media, as in education itself. Over the past decade, in particular, education has generally attempted to become more precise, more analytical, in its intentions, and the media have followed suit. In consequence, this handbook—while it is primarily concerned with the educational *mass* media, with the application of radio, television and supporting print and audio-visual materials to educational problems—has to range further afield than the technical specialisms of the production process.

This is by no means a bad thing. In the first place, the producer of educational media materials has a specific job to do, and the more he knows about related fields the better a producer he is likely to be. This is always the case, even in traditional television; the best producers are those who know something of the technical instruments with which they are working, and who can plan to the limits of their studios and equipment. If we add to this knowledge other elements of psychological, educational or social theory, the producer becomes more flexible still.

Second, whatever we are creating, it always helps to be clear as to why, and for what purposes, we are creating it. And this is exactly what the newer approaches to education set out to do: to investigate the rationale of education in far more probing terms. The media can certainly benefit from the same degree of introspection.

It is no easy task to summarize a decade of educational thinking in the compass of a few thousand words. Yet when the particular situation of the media producer is taken up, these changes amount to half a dozen simple maxims.

1. The use of media must be preceded by a clear statement of educational objectives, and of the contribution which media can be expected to make to realizing these objectives.
2. Media are part of an over-all process of educational innovation and development.
3. Media do not exist independently of each other.
4. Media are constantly changing, in form, technology, technique and potential.
5. Mass and interpersonal media are linked in a common process.
6. Evaluation and research are indispensable parts of the planning process.

A discussion of these simple precepts should be enough to put the modern producer in perspective.

The use of media must be preceded by a clear statement of objectives, and of the contribution which media can be expected to make to realizing these objectives. One of the most significant trends in educational planning has been the application of learning theory to practical educational processes. Though there is still a good deal of argument as to how people learn, one main contribution of the behavioural scientist has been to emphasize that learning proceeds in stages, with particular skills and techniques mastered piece by piece, and that efficient learning depends upon the content, order and interrelationship of the elements in the sequence. We will not, in other words, grasp a concept or process unless we master the elements and arguments out of which the whole is created. This recognition forces the teacher back upon a clear analysis of what he is trying to teach; he has to estimate how the learner will respond in order to present the sequence clearly.

This kind of analysis is most developed in techniques of programmed instruction, where tasks are divided into small steps, and the mastery of each step is monitored before the learner is allowed to proceed to the next. But the same habit of mind can be useful to the educational media producer. First, he must be clear about the objective of whatever programme he is preparing. What is its intended outcome? What relationship does it have to other materials? What should students be able to do, discuss, or attempt after experiencing the programme?

Within each programme, too, the same kind of discipline can be exerted. From a body of material, the producer selects key items or concepts which he aims to present. He has to identify main themes and decide which aspects can best be presented through the media with which he is working. Subsequently, he has to break down the concept into key stages, and decide in which order these can be arranged, so that a logical development ensues. He has to regulate the pace of his presentation, allowing time and opportunity for different phases to be mastered, and if possible he has to allow for checks on understanding. Within the mass media this is a difficult task; it is not possible for the media to interact directly with students, to question them on their response, to test comprehension in the same way as the classroom teacher. But there are some means, albeit crude, of approaching the same end: by allowing time to revise each phase (using a different means of presentation, for example using an animated diagram to follow a laboratory sequence), or by asking students to answer problems set, or respond to questions asked, during the programme, drawing upon the classroom teacher/monitor to evaluate results. In the newer forms of media, this kind of feedback is even more possible (where television programmes, for example, are being replayed to students on video-tape, not watched from a broadcast transmission, so that they are directly under the control of the classroom teacher and can be stopped and started at will).

Media are part of an over-all process of educational innovation and development. The techniques of the systems analyst have also been of great benefit to the educational planner and can similarly be transferred to the repertoire of the media producer. Systems analysis is concerned with the setting of objectives, with breaking down tasks into component parts, and with determining the order and time scales needed to complete an over-all assignment. This kind of approach has produced a barrage of technical tools (critical path analysis, network planning and so on) which can look very complicated to the outsider, although they are not so very difficult to acquire in practice. For the educational planner, the benefit is that he is forced back upon the reasons for education as a whole, and for particular aspects of the educational process. Where do the emphases really lie? On developing individual self-confidence? On creating a sense of national identity? On equipping students to work in the vocational situations open to them? On becoming literate and numerate?

This kind of analysis is at its most important in the context of curriculum development. At one time, this term meant little more than setting a teaching syllabus, identifying appropriate texts and materials, and indicating the content of teaching programmes. Today it envisages a much broader field, in which curriculum is seen as a process rather than a description of content. It is not only what is taught that is important, but equally why, and how, it is taught. Curriculum development becomes a team activity, a synthesis of work by the educational planner, the teacher trainer, the evaluator and research worker, and of course the media producer.

First, in this sequence, the over-all objectives of education (for a particular country, at a particular time) are set. Second, individual objectives are derived, for particular audiences and subject areas. Third, these objectives are translated into means—the best ways of achieving them are sought. Fourth, the implications of the resulting instructional system in terms of the classroom teacher are explored, since it is the teacher who will have to fulfil the objectives at an individual level. This in turn implies changes in the teacher training programme, both pre-service and in-service. Fifth, a means of assessing the process is required; the analysis of objectives and means, however elaborate, may be wrong, and the performance of teachers may be inadequate. So the evaluator and research worker are enlisted to examine how the process is working.

The most important feature to note is that this is a continuous and integrated process, and those involved have to work together from the outset in a team. Unless the evaluator knows how basic decisions were arrived at, he will be unable to measure performance. Unless the teacher trainer is involved, the realities of the classroom situation may not be taken into account at the critical planning stage.

The media producer is very much a part of this team effort. He has to produce materials which match objectives as they are specified, at both an over-all and at a particular level. He has to understand the concerns of his counterparts, otherwise his programmes may be irrelevant to the basic goals. He has to explain his intentions to the teacher trainer and evaluator and the limits of the technology open to him, so that they can in return make realistic demands upon his skills. There is little point in deciding that radio or television programmes are inadequate, if some indication is not also given as to why this is so, and how they can be better regulated.

Media do not exist independently of each other. One of the side effects of systems theory upon media has been a more sensitive appreciation of what the media can and cannot do. In general terms, we have understood for a long time that television is good for certain tasks, and radio for others (that television is a good laboratory demonstrator, for example, and radio a good stimulus to the imagination). But it is only in comparatively recent times that we have understood that media can be planned in relationship to each other (and to instructional situations), so that not only are individual strengths and weaknesses cancelled out, but they can also be used for mutual reinforcement. The result is, at best, rather like a carpenter laying out the tools in his tool chest, and deciding which to use, for what features of the job ahead, without ever forgetting the total task of building or reconstruction. So the media producer does not simply think in terms of producing a series of television programmes; if he works in a team, he reviews each instructional task and decides, in association with his colleagues, which components can best be treated through television, which through radio and so on.

The possibilities for multi-media working are only now being realized, and its potential is related very specifically to the degree of precision in other parts of the educational planning process. This kind of coordinated planning has operated, most effectively, in the United Kingdom Open University, where components of correspondence, radio, television, tutorial and counselling work, summer schools, assessment and examination procedures have been welded together in a sophisticated system which is highly disciplined in its use of media. Sophistication is much less possible in countries where educational objectives are less precisely determined, or in fields such as adult and informal education, where audiences are more diffuse and learning experiences less controlled. In general, the greater the coherence of the educational process, the better articulated the media system can be. But the potential exists.

The situation illustrates a paradox which the media producer will be well advised to bear in mind. His job may begin as an apparently straightforward exercise: to produce a series of programmes on a particular subject, for a given audience. But if he does his job properly, he will begin to ask detailed and sometimes difficult questions. What exactly should be taught? What are the best means of teaching it? How will the materials produced be used? What guarantee is there that the user will have those skills required to derive full benefit? What will happen in the classroom, once a production is over? How can one be sure that it is a "good" production? How in any case does one measure satisfaction or success?

Questions like this force educators back on their mettle. The media have a profound effect, in that they have their own deadlines and must have immediate answers—otherwise no programme emerges. One cannot put off a television transmission in the same way that one can postpone a tutorial. So a frequent result is that the introduction of media tends to make demands upon the planning processes of a total educational system, and so produces an environment where change is seen to be essential. It is a stimulus and a catalyst to educational innovation, which has to chart the way ahead. In doing so, however, it leaves the media producer alone, often without adequate tools or materials, desperately trying to energize others to give him the answers which he needs.

Media are constantly changing, in form, technology, technique and potential. It is only when a handbook of this kind is planned that authors come to realize just how much, and how fast, technology and its applications can change. This change occurs in two ways. The technical capacity and styles of the media alter with considerable frequency; at the same time new techniques, and new ways of applying existing technology, are constantly being sought and found, while responding to demands generated by teachers and educators. This book is concerned with educational *mass* media, i.e. with forms such as radio, television and supporting audio-visual and printed materials which are distributed to large audiences. In the main, these forms have been applied to education because people have seen that, in their capacity to reach wide audiences quickly and instantaneously, they not only offer low unit costs (programmes are seen by large numbers of people), but they also help accelerate change. By what other means, for example, is it possible to reach, and help retrain, an entire teaching force over a short period? Even a crash programme of teacher training courses would take far longer, and would cost more, than applying the mass media to this end.

Yet the use of mass media has produced its own problems, some of them very intransigent. At one time, television was viewed as a means of reconstructing an educational system overnight, or of providing a completely new structure where nothing previously existed. The formula has in fact been tried (for example in American Samoa), and it is possible to see that in certain fields media could still develop a new kind of infrastructure. In adult education, for example, where there has been comparatively little progress in developing countries, mass media (especially radio, which does not require over-sophisticated technical and electronic resources) could remedy such gaps.

But in the main, the orientation for educational media is towards improving quality, variety and opportunity in education. Media are now seen mostly as extensions and adjuncts to other educational forms. They are assumed to enrich work in the classroom, to extend new curricula, to enlarge learning experiences, to provide inexperienced and undermotivated teachers with a new set of skills. For such purposes they cannot be argued to be cost-beneficial, because they are not an alternative to other educational structures; the best that can be said for them economically is that they represent a cost-effective, sometimes even the only way of approaching particular problems within a reasonable time scale. They must therefore justify themselves on educational, technical and social, not on economic grounds

Once the media are seen in this light, as complementary to other teaching forms, some inherent disabilities are evident. The mass media reach out widely, but they are all things to all men. They do not respond to individual differences; instead they seek a rather sterile average audience. They do not pause to allow for questions; they press on at a regular, predetermined pace. They do not stem from clearly articulated demands; they represent a consensus of planners and producers.

Consequently, much of the effort of recent years has been towards a greater individualization and responsiveness in the mass media. This effort has had two directions: to further the technology, and to enlarge its range of application. Both have had significant results.

The range of media technology has seen a radical expansion over the past decade. We have seen satellites, both for greater distributive potential and experimental forms of direct broadcasting satellites (as is being used in North America and India). We have seen an expansion of colour-television formats, a greater miniaturization of technology, a greater reliability in automated equipment. Most of all we have seen developments in audio and video recording technology, with the spread of audiocassette recorders (cheap, easy to operate, capable of being automatically triggered at a distance), and of videotape recorders and cassettes, now with far greater reliability, compatibility and above all economy.

This is not an occasion on which to review this technology, but simply to point out that it is important for every producer to keep abreast of what is new or emergent in the field, and to review its implications for his own needs. All too often, the technology precedes the application, and if this cycle is to be broken, it is up to the media producer to project ahead, even to envisage what he would do with a new device if it were invented. For example, the new recording technology is highly significant, allowing teachers the freedom to take library tapes or to record programmes off the air, and use them within their own scheme of work, slotting them into their schedule exactly when required, reviewing them in advance for relevance, stopping, starting and replaying them to suit the pace and mood of each class. The applications of technology can be still more fundamental. Given a new technology, it is possible to design more radically with the new potential in mind. It is such a creative approach, for example, which has produced new forms of community involvement and development programming (referred to later in this book), where local media, either radio- or television-based, are used to generate specific materials for small communities, and where communities can be encouraged to see themselves and their aspirations mirrored in a stimulating and provocative form.

Such new approaches frequently mean that the structures of traditional media production have to be examined afresh. If, for example, there is suddenly a possibility of supplying audio or video recorders within an educational system, this may demand an entirely new kind of production and distribution mechanism. Possibly programmes should no longer be broadcast, or should only be broadcast for recording at off-peak times. Perhaps there is no longer any need for "broadcast quality" equipment to be used, if off-air reception is no longer contemplated.

Such planning innovations will be beyond the simple competence of the producer. He may have little power to redefine structures, or to convince administrators that for the sake of long-term efficiency and success an expensive investment in a particular system should be discarded. But if he knows his field, and can interpret it convincingly, in the end his opinion will be needed.

In one respect, however, the producer can contribute directly to enlarging the range of the mass media; he can use his own imagination and ingenuity to make the most of what he already has. A television service may have no more than a few cameras, but it can still experiment with techniques of studio animation, with creative graphic design, with imaginative television teaching. A film camera can be used, without a great deal of technical sophistication, for film animations of a simple kind. The media are not yet so old, or so entrenched, that their ways and procedures are firm and cannot be modified or extended without advantage.

Mass and interpersonal media are linked in a common process. Another realization has been that the mass media do not exist in a vacuum. In the school environment, the media are only as good as the use to which they are put; not only do materials need to be valid, but their users must be trained and motivated. Moreover, mass media are in no way unique, simply because they are electronically distributed; they have the same kind of function as other classroom aids, whether textbooks, teaching machines, programmed texts or chalkboards. Each tool has its function; it is the mixture of functions which counts.

In the adult field, however, the utilization process is more complex. At the school level, the environment of instruction is fixed: to make a "good" television or radio programme successful is primarily a matter of training and motivating the teachers. The adult learner is not in such a comfortable, disciplined environment. He may well be a solitary learner, working on his own or through correspondence routines; he may be part of a tutorial group, which comes together as and when meetings can be locally arranged. In many cases, even this kind of connexion does not exist. In attempts to change attitudes, for example, the media are part of a complex process of diffusion, of which relatively little is known even now (and even what is known is rarely incorporated into media design). Messages are planned by committees, produced and transmitted over the air waves; what happens to them thereafter depends upon the personal and social environment of individual and group listeners. The impact which a programme has is dependent upon the social circumstances of the listener (is he alone, is there competition for his attention, do others in the household share his interest?), upon his social contacts (does he talk about the programme with friends, in a club, in public transport, in the fields?), and upon the number of times the message is reinforced. This kind of knowledge is of the greatest importance in such applied fields as family-planning communication or development communication. It is important to know, in such situations, where and when the message will do most good; how many times it should be repeated; how closely it should be linked to delivery systems, and so on.

Certain principles, mostly commonsensical, are clear on the condition of media in the non-formal field. It is accepted, for example, that media are useful to attract a person's attention, to intrigue him, even to stimulate him to follow up an attractively presented idea. But for him to go a step further, and actually change his opinions or life style, requires an additional effort: the encouragement of a friend or community leader, the ready supply of whatever is being promoted or offered through the media. The media can introduce, motivate and reinforce, but they will not break down resistances. Here again, therefore, a form of team planning is required, which involves the co-operation of field workers, social scientists and development specialists. In the field of educational programming at the community level, these considerations are certainly of great importance. Some activities require the formation of special study or discussion groups; how should these groups be formed?

There have been many experiences, for example, with radio-based study groups or farm forums, and in many cases these have been unsuccessful, either because the group has run out of momentum, or because it has been unrealistically founded. There is a growing feeling that, where programming is designed for group study, it should be directed towards groups which already exist, with a firm social foundation and community acceptance, not geared towards special creations, whose sole *raison d'être* is the media base.

In such cases, the media producer has a need, and an obligation, to know just what is of relevance to his own purposes within sociological theory, and how he should take account of it in his planning. In general, the more that he knows about his audience the better; it is for this reason that he should travel regularly away from his base, meet his viewers, see how they respond to his programmes, discuss his problems with them, investigate and try to respond to their needs.

In more recent years, the problem of programming for community audiences has received a good deal of special attention in both the developed and the developing world, and one of the chapters in this book deals with this new field. There have been some interesting developments in the establishment of small local radio stations, for example, frequently of very low power, serving only a single community or group of communities. There have also been some creative uses of smaller video systems, ranging from cable systems serving a single community or township to mobile film and video touring vans, which not only show programmes to local audiences, but record the discussions which follow, track down and investigate community problems, use these as a basis for focusing down community reaction, or providing exchanges between communities.

Conversely, many media agencies have become concerned with the apparent rigidity of their own structures, and the lack of opportunity for audiences to participate, talk back or become creatively involved in their work. In some cases, broadcasting organizations have created special programme slots, for minority groups to produce and air their points of view, and the degree of audience participation in traditional discussion programmes, phone-in programmes and so on has increased dramatically. If we are to treat education in a wider sense, involving many forms of community development and self-expression, these techniques are of considerable importance.

Evaluation and research are indispensable parts of the planning process. In this new environment, where the media are part of educational innovation and media producers members of a co-ordinated team, the need for evaluation and research is more marked than ever before. In the past, it has been very much an undervalued part of the operation; evaluation systems for educational media are usually statistically based, concerned with the number of viewers, the quality of reception, and with some generalized commentaries on how programmes are rated. In a few cases, these systems have been extended to give more precise information on individual programmes, which can be used to advantage by producers when planning a programme series or developing new series, but mostly the information is returned too late for immediate improvements to be made. However, just as curriculum development is now seen in a broader, more human light, so evaluation is now treated as much more than a routine process of statistical coding.

Statistics are certainly important; we must know how our programmes are received, by what numbers of people, and whether or not the technical quality is adequate. It is also useful to have a guide as to how, in general, audiences react to such factors as pace, density of information, presentation and so on.

But in essence evaluation has to be planned from the outset as something fundamental to the whole media system. It is important that trained evaluators should be members of design teams and make their expertise felt and available from the beginning. It is important that regular studies should be made of audiences, even before programmes are produced, so that producers have available to them a profile of the target with which they are dealing. It is important that media systems should know the spread of reception equipment, when are the preferred hours for viewing, or what is the attitude of teachers and users to media materials.

There are also many specific questions which the producer wishes to have answered, with which the evaluator and research worker can assist. Experimental designs can be set up to determine which one, out of a range of possible techniques, is best suited to the introduction of a particular concept to a particular audience. Methods of content analysis can help him find out to what extent the final programme mirrored his intentions. Participant observation can help him trace the success of his programme planning or of the utilization process.

The distinction between evaluation and research is a difficult one to draw; perhaps the best formula is to say that whereas evaluation is concerned to monitor a system, research stands back from the system, and poses more radical, fundamental questions. Here also, the active participation of the producer is essential. Researchers know a great deal about research method, but their knowledge of production processes, possibilities and limitations is restricted, and for this information they must approach the practitioner.

There is, unfortunately, still a gulf between the research worker and the working producer, and often a good deal of mutual suspicion. The producer may feel the research worker is purely a theoretician; the research worker senses that the producer wants to operate only from intuition, and is likely to ignore research findings. Both are often correct. One of the biggest needs in the field of educational media is for a more regular dialogue between the two fields, and for a more frequent publication (in a simple and practical format) of significant research findings. It is often said that not enough research has been done in media; even so, what has been done has rarely penetrated as far as the practitioner.

To be effective, the working producer must have an all-round knowledge of many related fields and an all-round curiosity. He should be well-placed to obtain such knowledge; one of the prime qualities of the media producer is that, because he is required to work at speed, he develops a ready capacity to pick up the bare essentials of a subject. Communication is a mixture of disciplines; it is synthetic, and no producer can afford to work within a narrow technical specialism.

Many producers may have shied away from the current term "educational technologist". An educational technologist, with a comprehensive background in educational theory, learning theory, curriculum approaches, media planning and practical classroom experience, is supposedly in the best position to see the relevance of media and technology within the educational process. Whatever the implications of the term, all media producers should be, in the best sense, educational technologists. It is certainly important for them to have qualities of ingenuity, imagination, creativity, the ability to use technical equipment, to handle production matters. But it is even more important for them to know why they are doing these things—for which audiences, for what purposes, in the expectation of what results.

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Part I

Producing for educational television

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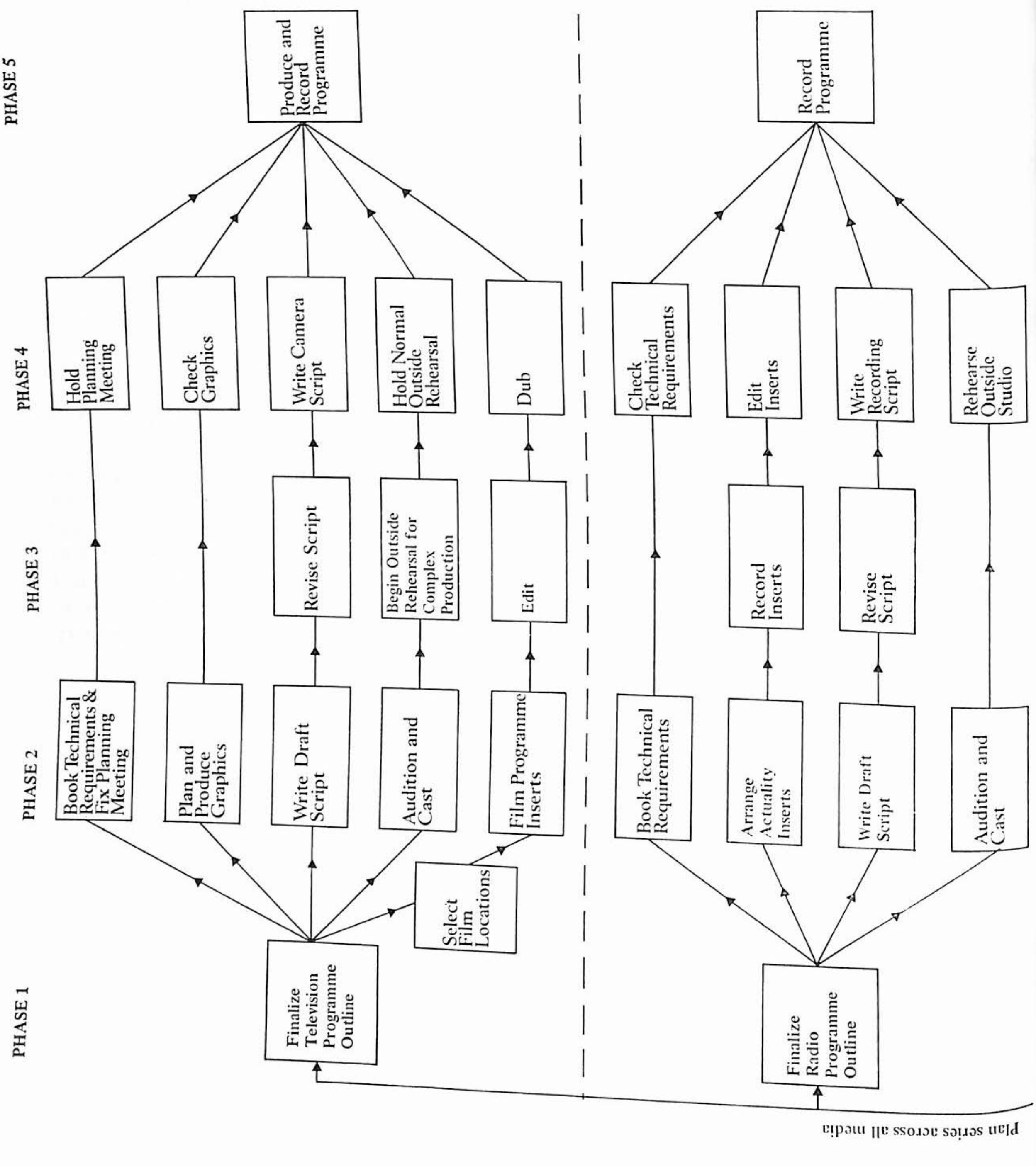
Introduction

For a further account of the educational planning process involving the media, the reader must (and should) turn elsewhere. This book is concerned with the practical arts of the producer, with programme preparation and realization. Nevertheless, it is assumed throughout that the producer is acting within a rational media system, in which objectives have been carefully thought through.

We shall begin with television, as the most complex of educational mass media. In many instances, what is said of television is true of other media, certainly in organizational forms. Accordingly, the sequence of operations required for television will be described in some detail; in the discussion of technical processes and production techniques for radio and audio-visual media which follows in Part II, only the main strands of difference will be explored.

To emphasize the continuity of production planning, however, the discussion is prefaced by a general network (Fig. 1), which shows essential activities involved in production across all media. The diagram is subdivided into five phases. Phase 1 is that of the preparation of programme outlines, after the curriculum planning process is complete, the relative roles of different media have been agreed, and series and programme objectives specified. Phases 2 to 4 are those of programme preparation: script and materials development, the compilation of inserts and illustrations, and preliminary assemblies. Phase 5 is that of final assembly, production or recording of programmes.

Further reference will be made in the text to this network, and to the interrelationship of its component parts. For the moment, it should be reviewed in general terms, in particular to trace parallel activities across all media.


PHASE 1
PHASE 2
PHASE 3
PHASE 4
PHASE 5
Finalize Television Programme Outline
Select Film Locations
Book Technical Requirements & Fix Planning Meeting
Plan and Produce Graphics
Write Draft Script
Audition and Cast
Film Programme Inserts
Revise Script
Begin Outside Rehearsal for Complex Production
Edit
Hold Planning Meeting
Check Graphics
Write Camera Script
Hold Normal Outside Rehearsal
Dub
Produce and Record Programme
Finalize Radio Programme Outline
Book Technical Requirements
Arrange Actuality Inserts
Write Draft Script
Audition and Cast
Record Inserts
Revise Script
Check Technical Requirements
Edit Inserts
Write Recording Script
Rehearse Outside Studio
Record Programme
Plan series across all media

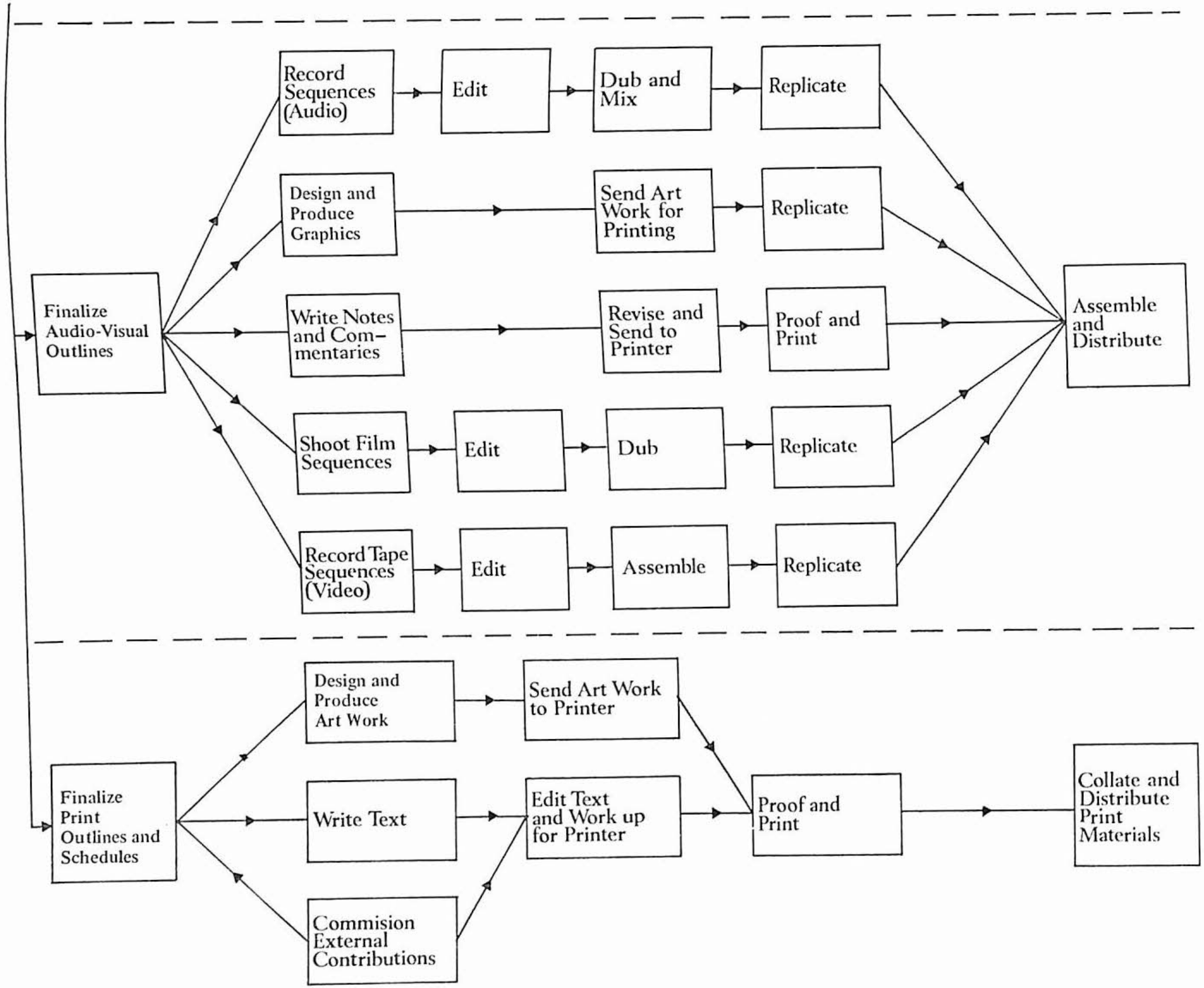

Finalize Audio-Visual Outlines
Record Sequences (Audio)
Edit
Dub and Mix
Replicate
Design and Produce Graphics
Send Art Work for Printing
Replicate
Write Notes and Com-mentaries
Revise and Send to Printer
Proof and Print
Shoot Film Sequences
Edit
Dub
Replicate
Record Tape Sequences (Video)
Edit
Assemble
Replicate
Assemble and Distribute
Finalize Print Outlines and Schedules
Design and Produce Art Work
Send Art Work to Printer
Write Text
Edit Text and Work up for Printer
Commision External Contributions
Proof and Print
Collate and Distribute Print Materials

FIG. 1. *The production process.*

Chapter 1

The production team

Alan Hancock

In a handbook designed for the media producer and his staff, we should begin with the human team involved.

The producer is the keystone of the production unit. He is in over-all charge of the series; he supervises the planning of programmes and the preparation of scripts, works with the educational unit responsible for programme planning, controls the selection of visual resources, rehearses with the presenter or television teacher and supervises (and frequently directs) studio recordings. It is essential, therefore, for him to have a clear knowledge both of the medium and of the classroom situation.

No one would pretend that a producer can be described in a few sentences, but it is quite possible to list the range of qualities which a candidate should exhibit. They include: teaching experience and an informed interest in education; a developed aural and visual sense; a capacity for quick thought and action; a capacity for forming good human relationships; executive ability and a talent for organization; imaginative flair; good intelligence.

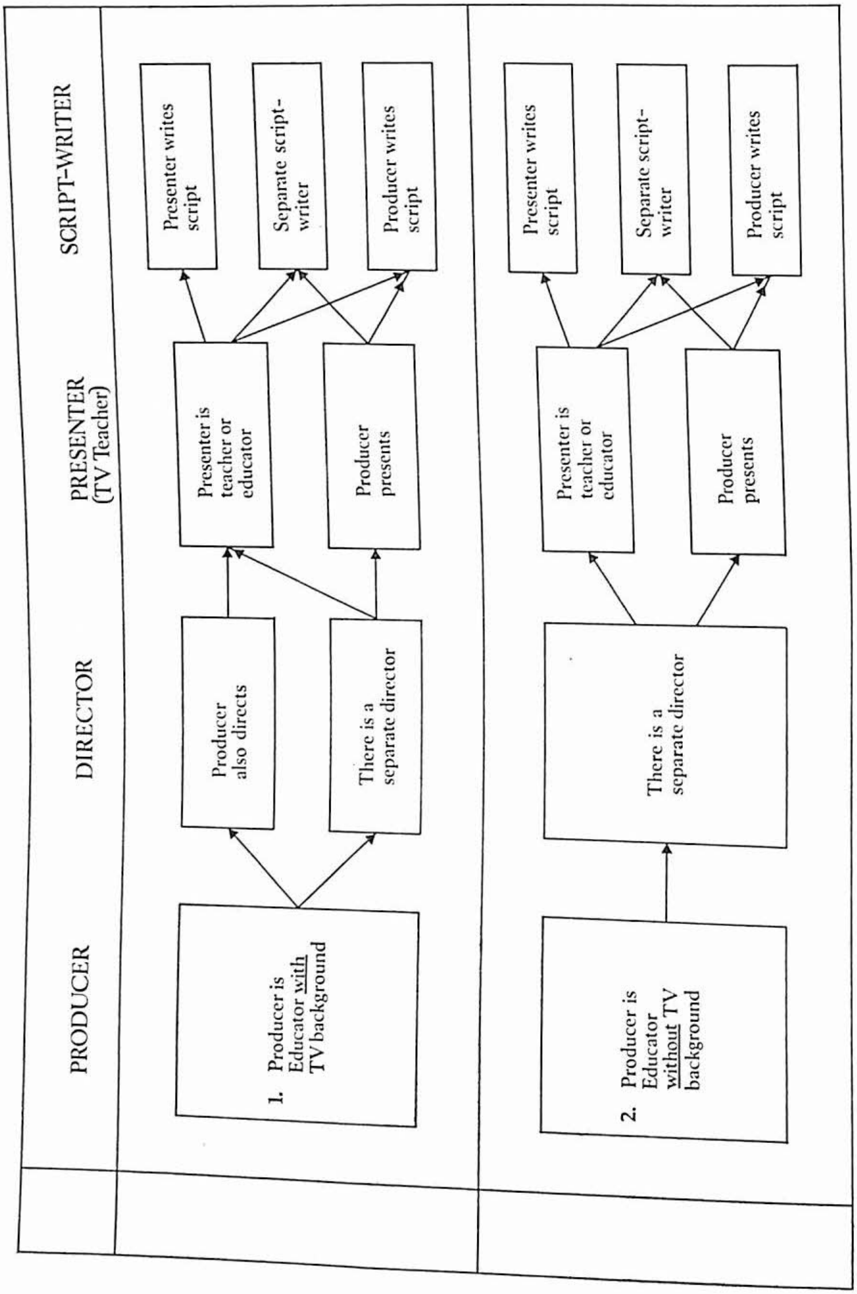
It is unlikely that any candidate will command all these qualities, but he must demonstrate a fair number.

What of the other members of the production staff? Educational media programmes are created by a production unit, a small cell of people working in unison on a common project. Technical services can be drawn on as required, from a general pool, but the flesh and bones of each series—the way in which it fulfils educational objectives—can only be put together as a long-term, joint operation.

The numbers of people to be found in the production unit, or production team, will vary according to the size of the service, the resources available, and the sophistication of programme formats. They can range from a single person to a group of six or more at the level of the national broadcasting service. The main functions of the production team are as follows.

Producers have over-all responsibility for the programme. They prepare the programme format, liaise with outside bodies, control the selection of script contents, visuals (film and graphics), and cast (professional actors and amateur participants), co-ordinate the activities of the production unit, and are responsible for budgetary administration.

Directors (when they exist independently of producers) oversee the translation of script and visual material into an actual programme. They deal with the cast in


PRODUCER
DIRECTOR
PRESENTER (TV Teacher)
SCRIPT-WRITER
1. Producer is Educator with TV background
Producer also directs
There is a separate director
Presenter is teacher or educator
Producer presents
Presenter writes script
Separate script-writer
Producer writes script
2. Producer is Educator without TV background
There is a separate director
Presenter is teacher or educator
Producer presents
Presenter writes script
Separate script-writer
Producer writes script

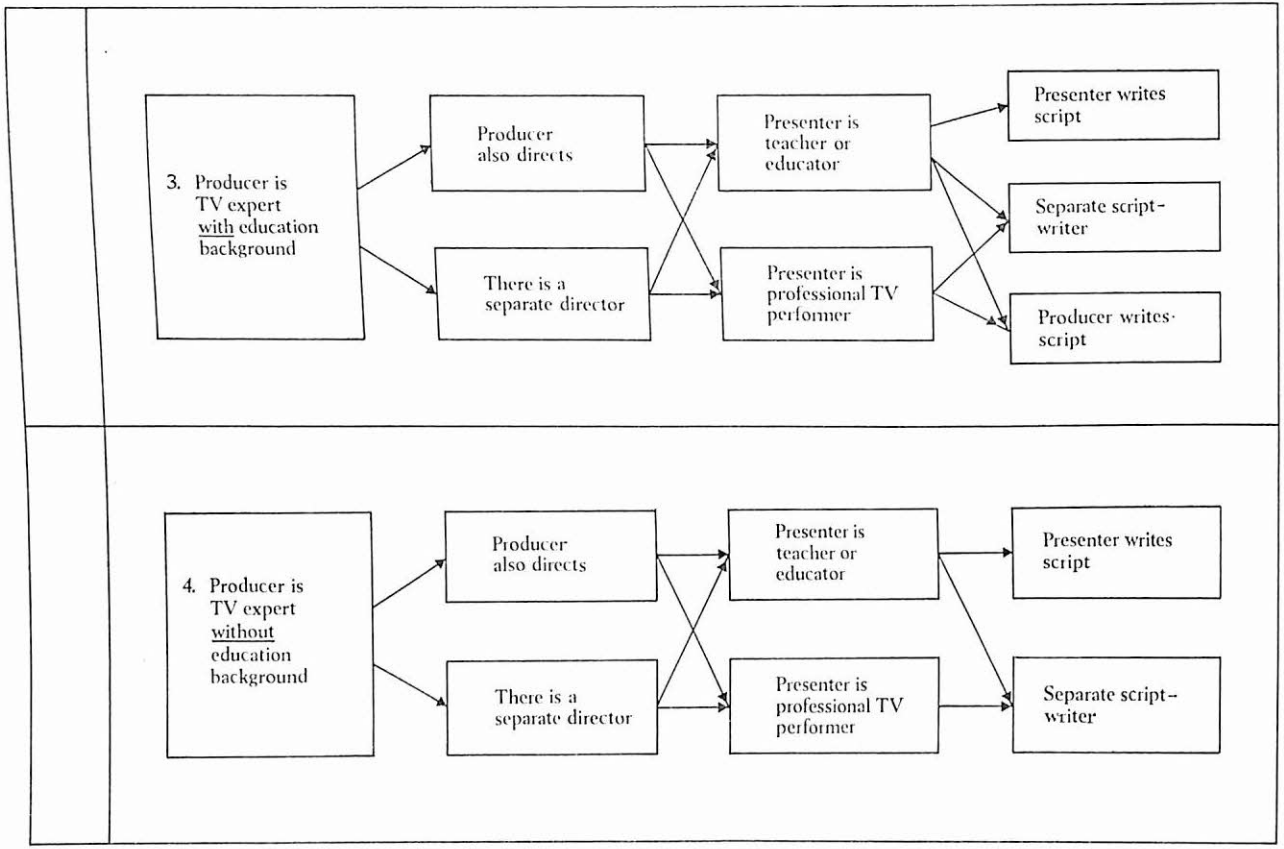

3. Producer is TV expert with education background
Producer also directs
There is a separate director
Presenter is teacher or educator
Presenter is professional TV performer
Presenter writes script
Separate script-writer
Producer writes script
4. Producer is TV expert without education background
Producer also directs
There is a separate director
Presenter is teacher or educator
Presenter is professional TV performer
Presenter writes script
Separate script-writer

FIG. 2. *Production roles.*

rehearsal and during transmission and supervise the movement of cameras in the studio.

Presenters (often known as *anchormen* or *television teachers*) perform in the studio, using a variety of illustrations.

Script-writers write the scripts of the programmes (with full dialogue, and an indication of the forms of illustration to be used, but without technical instructions).

Production assistants (P.A.s or assistant producers) assist the producer in programme preparation and frequently direct both film sequences and studio recordings. They are often junior, or trainee, producers.

Script assistants (producer's assistants or production secretaries) look after the administration of the production unit and assist the director in the control room. They keep a full record of the production's history (including the budget), book artists, prepare scripts, arrange planning meetings and rehearsals and book all studio services.

Research assistants (R.A.s) carry out basic research for ETV programmes, including film research.

Some of these roles may, in a smaller service, be conflated or eliminated altogether. Producers, as has been said, frequently double as directors; presenters are often responsible for their own scripts; and it is a very lavishly financed operation which can afford either independent researchers or production secretaries (usually at the national level only).

There is, however, more to the allocation of functions than simply economy. A question of philosophy is also involved. It arises from two causes: the form and sophistication of production; and the mode of development of a particular service (i.e. its history, and its context).

The form of production is a matter of scale; at a very simple level (e.g. a piece of overspill teaching) there will be no script as such, and no need for elaborate, sustained planning. Some of the functions listed above may then cease to exist at all. There will be no script-writer, and no assistants will be necessary. Yet at the level of a multi-media service, created by a national broadcasting system, all the roles will be fully played and may still need further support.

The mode of development is a more difficult factor to pin-point. It arises partly from the educational emphasis laid by a media service, partly from the context in which the service is found, and there is often what amounts to a cultural split between European and American tradition. (By now, of course, this is a split which has spread throughout the developing world.)

In Europe (and in Japan), where ETV developed as a function of the broadcasting organizations, services tended to be producer-oriented. Following the pattern of the parent service, the producer would be expected to have a good command of broadcasting techniques, to supervise the entire production operation, and to call upon the services of presenters and script-writers who would be fully competent, but would nevertheless occupy subordinate roles.

In the United States, the pattern was quite separate: here the media service engaged in instructional programming was teacher-oriented. Where programmes were originally the creation of an education authority, it was natural for a teacher to take over-all charge of the production, and to continue his teaching role right into the studio, bringing in a television expert in a subordinate capacity to undertake routine direction. So the producer would be a teacher and not versed in television techniques; he would be disinclined to work from a written script (or if there was a script, he would write it himself), and he would act as his own presenter or television teacher.

In practice, this can lead to a number of configurations, in which the functions of the production team are differently arranged. We are not so much concerned with research assistants and assistant producers (who are basically extensions, or subdivisions, of existing roles) as with the basic functions of producer, director, presenter (or television teacher) and script-writer. Some of the principal permutations are expressed in Figure 2, assuming producers with four distinct backgrounds. Likely combinations will be found by following through the connecting lines.

Is any one of the permutations to be preferred? There are some strengths to be found in both the European and the United States approaches: the producer-oriented approach leads to a richer quarrying of the television medium itself, the teacher-oriented approach to better judged performances by the presenter and sometimes to better utilization. However, today, whatever the original background of a producer, presenter or script-writer (or of a programme director, for that matter), some cross-fertilization of educational and broadcasting disciplines is essential.

Chapter 2

Production phasing and budgeting

Alan Hancock

Having isolated the team-members, what do they do? In the systems diagram reproduced in Figure 1 five main stages in producing for educational media were specified. If we take the network for television, then: Phase 1 involves the detailed development of a programme outline, indicating the main requirements, format and organization of the projected programme. Phases 2 to 4 continue with the process of preparation (including main strands of scripting, auditioning, casting and working with performers, technical planning, graphics and design, and filming). Phase 5 infers the final production process, where these several inputs are brought together.

The programme outline

The preparation of a programme outline is bound to vary from service to service; there is no standard format or practice. Nevertheless, the function of a programme outline is always similar; it is a means of bringing together the thoughts of the producer in a coherent way, and of indicating to him and to others what means and methods he expects to choose to realize the programme's objectives.

So, the outline is a brief statement of intent. It does not have to be overlong; indeed, brevity is an advantage, as it encourages precision. It should state, first, the programme's objectives: its target audience; its duration; its relationship to other media; and its relationship to previous or subsequent programmes. Secondly, it should summarize the main arguments or contents of the programme, and the means of illustration. A division into studio and film sequences will be very useful (from the technical planning viewpoint), and resources can best be spelt out by dividing the outline into two halves, one representing content, the other format. A characteristic example might therefore be as shown overleaf.

The model chosen is deliberately simple; an outline may run much longer, or much shorter. It may also be much less specific, where details have not been finalized (for example, it may not be known whether or not the Director-General of Unesco is willing, or available, to give the intended interview). But, for better or worse, it will serve to: (a) help the producer assess his requirements for the programme (financial and logistical), and to begin the various budgetary and booking procedures; (b) inform other service departments (e.g. those for film, graphics, or administration) of the load anticipated of the programme; (c) allow other

PROGRAMME OUTLINE

Title of series: Agencies of the United Nations.
Title of programme: Unesco.
Objective of programme: To introduce the main activities of Unesco and its position within the United Nations system.
Audience level: Secondary-school children aged 11-13.
Duration: 25 min.
Relationship to other media: Supported by a parallel radio series, and specifically by a radio programme broadcast in the same week which includes interviews with senior programme officers of Unesco.

A teacher's guide is also produced in association with the series, providing background information and indications of other resource material.

A pupil's pamphlet (optional) is also available, giving background and pictorial data on United Nations Agencies, and describing characteristic projects in the developing world.

Relationship to other programmes: Number 2 in a series of six programmes. The first programme gives a general introduction to the Agencies of the United Nations; other programmes are concerned with the work of FAO, WHO, ILO, and a final programme deals with the activities of some of the smaller Agencies.

OUTLINE

FORMAT	CONTENT
Telecine 1 (15 s/15 s)[1] Opening titles (library film).	Montage of Unesco projects.
Studio 1 (30 s/45 s) Anchorman in main setting.	Anchorman introduces programme.
Telecine 2 (3 min/3 min 45 s) Specially shot film, with library film cutaways.	Film sequence, based on interview with Director-General of Unesco, who describes the main aims and activities of the organization. Interspersed with cutaways to projects and major activities.
Studio 2 (2 min/5 min 45 s) Stills, animated diagrams.	Anchorman shows structure of organization, and relationship between headquarters and field staff.
Telecine 3 (6 min/11 min 45 s)	A characteristic project in Asia is described, based on the work of an associate (junior) expert.

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[1] The first figure gives the duration of the sequence; the second figure gives the cumulative timing of all sequences added together.

Studio 3 (6 min/17 min 45 s) Studio discussion.	Anchorman introduces project officer and associate expert interviewed in film sequence, together with host country counterparts. Discusses the following: What are main problems faced in project development? How realistic are project aspirations? Is the system as it stands too far removed from the actual scene of operations? Is there adequate co-operation with other agencies and donors?
(1 min 15 s/19 min) Stills, animation.	Anchorman reviews main points of programme.
Telecine 4 (30 s/19 min 30 s) Closing titles (superimposed over library film).	Credit titles.

interested agents (e.g. other media producers, planning committees, etc.) to see how this particular programme fits into their own plans, or fulfils their intentions.

For this reason, the programme outline should have a fairly wide circulation. (In the case of a continuous series, it should be distributed together with outlines for other programmes.)

Where multi-media series are envisaged, outlines for the various media should be distributed together, so that over-all intentions and requirements can be assessed.

Programme preparation

In many ways the art of media production is the art of doing many different things at the same time, without losing track of the whole process of which they are a part. We have already isolated a number of major strands, each of which will involve separate specialists and (in the case of larger organizations) separate service departments. The principal items with which we are concerned here are those of technical planning, graphics and design, scripting, working with artists, and filming. Their contribution to the whole programme has been expressed in the programme outline, but they must now be allowed to take their separate paths, before coming together again in the studio production.

For the next stage of his work, therefore, the producer has the following tasks to carry out.

First, he has to cost out the resources which he wishes to use, and obtain financial authority. This will depend upon the complexity of the service within which he works, but he will certainly have to match his desires against a known resource level, or against a fixed budget for the series. Of course, if the series has an over-all budget, he can average out his requirements across all the programmes, reserving film sequences, for example, for only a few important elements.

Second, he has to fix meetings with the

various specialist departments concerned (e.g. with the designer, technical manager, film editor, etc.). At least one meeting should be a joint planning meeting, where various specialists discuss the programme design with the producer and his staff and each has the benefit of the others' reactions. It is important that, at this early stage, the final production is still seen, thought of and discussed as a totality.

Third, he must book ahead for various services, and issue contracts as required. Film crews have to be reserved in advance; so do studios and studio personnel. It may well be that certain special effects (e.g. back-projection) will need special booking. Such complex processes as film animation require advance reservation; actors similarly need to be auditioned and booked in advance.

Fourth, he has to draw up an over-all schedude for the weeks ahead, in which main activities are correlated. This not only serves as a reference point for everyone on the production, but also allows the producer to determine where his critical path lies. Thus, for example, his film editing must be finished in time for the dubbing of film inserts to take place, and for the laboratories to produce final prints in advance of the studio production; the same is true of other design and technical areas. The main outlines of the sequence are again clear in Figure 1. The best method is to start with the end date, and to work backwards to fix starting-points—it is surprising how often this method highlights difficulties at a very early stage.

Finally, he has to allocate responsibilities fairly and squarely among his production team, so that each person knows what is expected of him, and can proceed independently. The more that responsibility can be devolved and decentralized, the better for everyone concerned—as well as for the production.

It is important to note that there is no constant time sequence for any programme; everything will depend upon the character of the production, and on the time scales involved. In a current-affairs production, there may be only a few days between the stage of the programme outline and the actual recording or transmission day; this in turn will have its impact upon the resources available to the programme. Obviously a great amount of special film or graphics material cannot be specially prepared in such a short span of time. Other programmes may be planned a year in advance, and considerable time may be available for preparation, for testing and so on. So the actual phases of production are constant in their interrelationship, but the duration of each event is a very different matter.

A possible pro forma for the producer to use to organize his requirements might be as shown in Figure 3, where circles indicate the characteristic position of each activity in relation to other activities. However, in the final version, as used by the producer, these would be replaced by actual dates.

Budgeting

The technical processes involved in Phases 2 to 4 will be described in detail in later chapters, but budgeting and the procurement of resource materials are areas which have to be taken into account from the earliest planning stage.

Even in the smallest of media services, it is advisable to make producers directly responsible for at least a proportion of the finances of their programmes. There are many items (e.g. scenery, graphics, film,

Scheduled date										
Script										
Outline	●									
Draft script		●								
Revised script				●						
Final script								●		
Camera script									●	
Artists										
Audition		●								
Book			●							
Pre-filming					●					
Outside rehearsal									●	
Camera rehearsal										●
Design and graphics										
Planning meeting		●								
Booking			●							
Sketches			●							
Review									●	
Camera rehearsal										●
Technical planning										
Planning meeting		●								
Book special services			●							
Outside rehearsal visit									●	
Camera rehearsal										●
Filming										
Planning meeting		●								
Book film requirements			●							
Film crew needed					●					
Editing						●				
Dubbing							●			
Print to laboratories								●		
Show print returned									●	
Camera rehearsal										●

FIG. 3. *Production scheduling.*

artists' fees) which can be directly attributed to a particular programme or series of programmes, and the producer will often feel freer to manoeuvre if he is allocated a specific sum of money to cover all such costs, which he can then manipulate as he thinks fit. We have, therefore, to distinguish between two kinds of cost, and two methods of costing: between above-the-line and below-the-line costs; and between direct or total costing, and indirect costing.

The items to which we have already referred, which are immediately attributable to a particular programme, are usually known as "above-the-line costs", because they are clearly identifiable as being incurred by that programme. Each production, however, draws upon a considerable range of support services, such as technical and film services, the use of studios and studio equipment, which may come out of a common pool and are therefore less easy to apportion, but which are nevertheless costly to provide (far more costly than the other, above-the-line items). These are therefore termed "below-the-line costs".

We may choose to allocate a limited amount of money to a producer, to cover above-the-line items, and to pay for the other indirect services through a general departmental or service vote: this limits the degree of financial responsibility of the producer, and is the basis of indirect costing. Alternatively we may attempt to make each producer pay for every service which he receives, and allocate to him a proportionately larger sum of money: this is the method of direct costing. This second method is, of course, much more difficult to devise; it involves setting a rate for every service provided, and charging each producer according to his use of the service. In the case of a television studio, for example, we might set a fixed rate for the use of the studio, with standard equipment, for a standard unit of time. If the producer required additional facilities, or wished to use the studio for a longer period, the rate would be adjusted accordingly, in line with a published tariff. In the case of an item of graphics, two separate charges would be incurred: one an above-the-line cost, representing the cost of materials used; the other a facilities or service charge, covering the use of personnel and technical equipment.

There are advantages and disadvantages to each method of costing, and ultimately questions of scale are involved. A small media service, with limited personnel and resources is best advised to apply indirect costing; the range of facilities available is small enough for these to be deployed efficiently using relatively unsophisticated administrative and accountancy methods. Direct costing calls for more complex accounting, and often for data processing; it makes heavier demands on its producers and its supervising staff, in that both have to estimate their needs and deploy their resources far more precisely. But at a certain level of operation (say at that of a State or national service) it can yield high dividends in cost effectiveness. It helps to ensure that all technical services and facilities are being used efficiently; financial responsibility is placed firmly on the shoulders of producers on the one hand, and on service departments on the other, and a healthy element of commercial exchange is introduced. There is a continual pressure on both sides to examine what they are getting, or providing, for their money. Producers are less inclined, under a system of direct costing, to use resources gratuitously; they may also have the advantage of financial transferability across a wide range of resources, facilities and services, which can often, with some ingenuity, help them produce exactly the kind of programme they want at the sort of budget they can afford.

Direct costing may well be something beyond the range of many services. Yet, at whatever level a service operates, it is useful to give a degree of financial responsibility to producers, and to hold them strictly accountable for such expenditure. (If possible, some degree of convertibility should also be offered, i.e. producers should be able to trade in some facilities or services against others which they require more, in so far as this can be managed within the administrative structure of the service.) All this involves a three-stage process, beginning with the submission of programme budget estimates at an early stage of planning, revising and updating these estimates as planning develops, and finally comparing the actual costs incurred with those estimated, after the recording or transmission is complete. The process naturally involves a regular dialogue between the producer and whoever in the service is responsible for over-all financial arrangements (the same person who has made the original allocation, or who has made a budgetary allocation). It also calls for a reality adjustment. Any producer who consistently exceeds his budget, without adequate justification, has at least to understand that later productions may be underfinanced, and at worst that his post is in jeopardy.

As an illustration, some characteristic areas of direct and indirect costing are given below.

ETV Organization: Indirect (below-the-line) costs (staff, facilities and resources)	Direct (above the line) costs (fees and materials)
Production-staff salaries	Artists' fees
Design-staff salaries	Repeat fees
Graphic-staff salaries	Walk-ons
Visual effects and models	Copyright
Scenic projection (still or moving)	Music
Scenic construction	Hiring of premises and locations
Costume	Photographs
Make-up	Scenic construction
Floor managers	Graphics
Rehearsal rooms	Visual effects
Film shooting	Costume
Film shooting (silent)	Make-up
Film editing	Hired technical equipment
Film dubbing	Film purchase
Film lighting	Film stock and processing
Studios	Film lighting equipment
Studio cameras	Transport
Outside-broadcast requirements	Videotape
Videotape recording	Hospitality
Videotape editing	Transport
Telecine	Travel and subsistence expenses
Other services	Miscellaneous

Resource materials

Availability of source materials is another limiting factor. Most services will want to use a good deal of material which they cannot be expected to provide for themselves: particular areas being film, photographs, music, and the use of literary and dramatic works. Film can be taken as a characteristic example. This has not only to be secured (often from abroad), prints made and edited, but copyright clearance and payment have also to be negotiated.

In the main, films, like other materials, are protected by copyright laws, and any use of them for television purpose incurs two obligations: first, to secure permission to use the film material (which may not always be forthcoming, especially if only sequences or extracts are required), and second, to negotiate, and pay for, the right to broadcast the material.

The only solution is to approach the producers or distributors of any material required independently, as early as possible, and to state the precise way in which it is to be used. Often, educational media services can secure favourable rates if they state clearly that they will be using the film in an instructional context. New services, too, can sometimes secure "pioneer" status, which reduces the scale of payment until a service has had time to build up its resources. When writing to a distributor, however, be careful to state the way in which material is to be used (e.g. whether it is the whole item or an extract; what length of extract is contemplated and where it occurs; whether or not the original sound track is to be used; how many transmissions are contemplated; whether further transmissions or alternative distribution of the finished programme are contemplated; whether any sequence may be reproduced in another form; whether credits can be given to the producer or distributor). Each of these factors can affect the final payment; some distributors, for example, will waive fees in return for a credit.

Clearance of copyright and the payment of fees for permission to use material are necessary in many areas. Photographic stills, if acquired from news or other agencies, are also liable (normally irrespective of the length of time for which they are shown on a television screen), and these payments, or a proportion of them, will normally be due for each transmission of a programme. Music performances, and especially gramophone recordings, are also protected; so are literary, dramatic and artistic works. While short literary excerpts may be used free of charge, under the heading of "fair dealing", any lengthier use incurs a fee. Paintings, sculptures and drawings are in the same position, unless they are permanently exhibited in public or are only used as background.

There is also the question of performers appearing in programmes. Performers naturally have rights in their material, and any media service needs to appoint a contractual representative, to negotiate contracts in which the rights both of the service and of the performer are clearly formulated. It is becoming increasingly difficult to secure an "all rights" contract for any kind of work. The number of transmissions envisaged, the scale of payment for each repeat performance, the right to distribute material after an original transmission have to be clearly spelt out.

Production

The stage of studio production is the terminal stage of the schedule, the point at which all planning processes converge. It is also the point at which the ability of the production unit to work as a team is tested to the fullest, in the environment of the studio. As such it will be given a separate chapter, later in this section.

Piloting

One aspect of programme development which has important implications for the producer is that of piloting. As was described in the Introduction, the main function of media systems planning is to make programmes and materials as relevant and specific as possible; hence the importance of the evaluation process, which feeds data on programme utilization and audience reaction back to the planners and producers, so that they can modify weak links in the chain when the next production cycle begins. Piloting might be described as evaluation in advance. It involves the production, in prototype form only, of selected materials at an early stage of development, so that these can be tested with sample audiences, and modifications made before resources are invested in final production.

The degree to which piloting is possible will vary from organization to organization. Some lack the resources for prototyping, or are unwilling to make them available because they have not been persuaded of their necessity. In other cases, decisions on media allocation are made so late that there is simply not enough time to allow for pilots. While the decision to do so is a policy matter, out of the hands of the working producer, he should certainly try to persuade his directors of the importance of some kind of prototype effort; human and material resources will be saved in the long run if snags are ironed out in advance, before costly processes of production and distribution are committed.

The character of the pilot will also vary from medium to medium. In the case of television, a fully assured studio-quality production can rarely be undertaken, except by the larger organizations; but to some extent the shape of the programme and its style can be inferred by a script, associated print and audio-visual materials, sample graphics, rough film sequences. It may also be possible roughly to record the programme, or characteristic excerpts, on a helical scan videotape recorder, without fully involving a broadcast studio.

Radio is easier, and a more or less complete prototype can usually be devised. In the case of audio-visual materials, working formats can be used, and for film, a rough cut can be shown. With audio-visual materials, unlike broadcasting media, the major cost comes at the point of physical replication, so that piloting with experimental audiences should be especially worth while. In the case of multi-media presentations, samples of all media should be shown, if criticisms are to be applied to the system as a whole.

The techniques of piloting can range from simple discussion of the materials with experts, teachers and audiences, to more controlled approaches, in which special questionnaires are designed, sample audiences are monitored during a viewing or listening session, and interviews are conducted by trained observers. For such specialist approaches, expert advice and involvement are necessary. It will also help if the evaluators are consulted while the pilot programme is being designed, as quite slight modifications in production design can often make their task easier and more effective.

The production sequence for piloting is the same, in microcosm, as that for production as a whole, with the same disciplines of planning, but with fewer resources available. In the production network (Fig. 1) it can be regarded as part of, or as an extension of, the series' planning process.

Chapter 3

Script-writing and performing

Alan Hancock
Tan See Lai

We should now begin to separate out the various pre-production strands, in order to grasp the technical essentials of each. The core of any educational television production is the script.

Scripting

The script is not only the blueprint for a production; as it develops, it mirrors, and brings together, all other strands of activity. No matter whether the script is written by an outside contributor, or by the producer himself, it will still have, in the end, to consolidate all visual and aural elements—and most producers know from experience that they will be bound to do a good deal of editing, however gifted or talented their script-writer may be, simply because the script is the overt reflection of a number of creative sources, and only they can see these in unison.

Who should write the script? This is an issue which has been fiercely contested, yet in the end, the answer is dependent upon the nature of the programme, and the skills of the producer. Some programmes must be largely written by a producer: many forms of documentary and current-affairs programming, for example, depend almost entirely upon the way in which a producer edits together actuality materials, without commentary, or upon marrying together a number of materials from library film sources. Equally, a programme may depend so much upon elements which can only be foreseen as the preparation period develops (e.g. the availability of subjects for interview, the filming of technical processes), that unless a script-writer is a full-time member of a production unit, his work will be too subject to modification to be useful. Yet other programmes (for example those with substantial dramatization) obviously require a separate script-writer unless the producer is also gifted as writer and dramatist. It is therefore up to the producer to decide on the most economical way of dealing with script demands, taking account of time scales, the nature of his programme, and his own writing talents.

He must, however, be prepared to take control of script editing and development, and to monitor its progress throughout. It is important to remember that, although a script is phrased in words, the end result will be a blend of words and pictures. A producer has therefore to develop a special kind of talent: he must be able to visualize the screen impact of the words and instructions before him.

If for this reason alone, a script cannot afford to grow too quickly. It is subject to change and reinterpretation, as each stage of the pre-production period unfolds, as graphics are sketched out and prepared, as film sequences are shot and edited. Even to the stage of camera rehearsal (and sometimes beyond) the producer has to remain flexible.

Consequently, the script follows several independent stages: namely the draft script, the revised script, the final script, the camera script. Each of these reflects a different point in the production cycle.

The draft script

This is the first stage—an expansion of the programme outline into a continuous text, roughly as long as the final programme. It states what is anticipated of studio and film sequences, details fully those sequences which can be elaborated at this early stage, and includes whatever elements of visual illustration and format are already agreed. It is therefore likely to be fairly complete for studio and dramatized sequences (since these must be firm, or reasonably so, in order to allow graphic design and rehearsal with actors to proceed), but its film elements in particular will be tentative. Filming (especially location filming) is always subject to modification, since few documentary subjects can be shot to order.

The script-writer should attempt, in his first draft script, to do the following: (a) give a full and rounded sense of what the final programme will contain; (b) provide ample illustration and guidance to such service departments as the graphics unit of what processes and concepts have to be illustrated; (c) provide a good working base for presenters and actors; (d) guide other media producers, who are working on ancillary materials.

Scripting is in many ways a born art, and there is a limit to what can be taught. However, assuming that the ability is there, a number of basic precepts can still be applied to any script, as follows.

The script should be personal, tailored to the person or people who are to present it. Naturally, any presenter worth his salt will want to modify a script to suit his own delivery, but even so, the scriptwriter should also try to write in the idiom of the presenter.

The script should be simply and colloquially written, in the natural and informal style of the culture to which it belongs. The proviso is important. Guidance is often given on using simple language, avoiding passive constructions, impersonal forms, literary phrases and so on. But this must always be related to the culture of the audience. There are cases where the natural idiom of a culture is more formal than Western English; what is important is that the final style should seem natural and unforced to the viewer.

There is more to a script than words. If pictures are dominant, they should be allowed to tell their own story; if the pictures will work on their own, let them do so. If there is doubt about a paragraph, the best rule is to eliminate it. It is often a good idea to dictate a script into a tape recorder, and then to have it re-typed; in this way, unnatural constructions can be avoided. Remember that on paper, a good television script often looks eccentric—it is bound to do so, as it is only telling half of the story.

The script should be economical. It is being applied to a medium where a number of vehicles are available to carry a message, and too many asides or explanations will detract from the over-all effect.

Not every item in a script needs to tell the same story. It is a well-known technique, in documentary filming, for picture and commentary to be set against each other, in a kind of contrapuntal format. Mostly, this technique is used to achieve an ironic or poetic effect (as a television metaphor). Adaptations of the technique can also be used in educational television. For example, one production of a children's programme had a fairy tale commentary set against the travels of a young girl through her own native city, so that the continuity between fairy tale and myth, and the real discovery of childhood, was thrown into relief. This is all part of the imaginative repertoire of the producer. In educational television, all too often imagination and creativity become lost in a routine search for didactic accuracy.

The revised script

The revised script is exactly what it says—a new version of the draft script, reflecting external comments and also recent production decisions. So it may include the text and commentary of film sequences, a more detailed explanation of graphic and animated effects, and incorporate criticisms and suggestions of those who have read the draft version.

The final script

This is next in line to the camera script—a final description of what the programme will contain before technical instructions, and the minutiae of production organization, have been added. It is this script, for example, which is used by presenters and actors during the outside rehearsal period.

The camera script

This is the final format—a blueprint for performers and technicians alike, once they enter the studio. It will be dealt with in more detail later in this section; essentially, it gives comprehensive instructions to assistants and technicians on what is demanded of them.

Artists and performers

Performers fall into two main categories: actors and presenters (alternatively known as anchormen, or television teachers).

Actors have a somewhat specialized role in educational television. They are used mostly for drama productions and for dramatized inserts, and they are recruited specifially for each production or series in which they appear. The degree to which the acting profession is organized professionally varies from country to country, but in many cases, actors are represented by unions or professional associations, and set fee scales are negotiated by these organizations. Thus actors will be paid a specific amount for each television appearance which they make (an amount which varies according to the experience and professional reputation of the actor concerned), plus additional allowances for attending rehearsals, for filming and on occasions even for attending an audition. In many cases, the actor is represented by an agent (who is financed by taking a percentage of his client's income), and it is the agent with whom the producer, or more usually the booking representative of the television organization, deals.

Auditioning is a common feature of life for those who work in drama productions. In some countries, actors are listed in a directory of theatrical talent, usually with a photograph and some indication of the roles which they have played. The producer may therefore audition a number of potential actors for a role (some of them on the recommendation of fellow producers or from his own prior experience, others sight unseen from the theatrical directory). In the majority of cases, however, the educational television producer will not be working regularly with professional performers. He may be working with amateurs, or with teachers, seconded either full-time or part-time to work in the media service. Some consideration is given in Part III of this handbook to the specific problems of drama, but in the main, the educational television producer's concern will be with a single artist—the presenter, anchorman or television teacher.

The presenter

As we saw earlier the presenter's role varies according to the ETV establishment in which he works. Some presenters write their own scripts and some are even responsible for the production of the programme, working in close collaboration with a director. Others are teachers who have been given scripts to present on a part-time basis. These presenters are of two kinds—specialists and general presenters. The specialist presents a specific subject in which he is qualified as a teacher. In science and maths programmes, for example, a specialist is often necessary in order to carry out demonstrations and make the explanations which the programme requires. A general-purpose presenter is usually able to conduct programmes of a less-specialized nature; even though he does not necessarily know in detail the subject-matter of a programme, it is of a sufficiently general character for him to put it across convincingly.

Selection of presenters

In selecting a presenter to appear in a production, one would first of all choose a teacher who has the best knowledge of the subject; the specialist who speaks well and has an acceptable on-camera style is a godsend to producers. There are times, of course, when the specialist clearly lacks the personality to put his message across effectively, and the simplest solution in this case is to find another kind of performer—the general presenter. For this it is useful to look for a teacher who has a speech and drama background or one who has attended a television course at college. Any of these activities can be valuable, depending on the quality of the experience and instruction received.

It is wise to draw presenters from the ranks of practising teachers, using them on a part-time basis. It is all too easy for a teacher, who has withdrawn from the classroom in order to devote himself full-time to television work, to forget what he has learned over the years and to become totally divorced from the classroom situation.

But whoever the presenter is, if he is to be successful then he must possess certain basic qualities. Poise, correctness of speech, enthusiasm and personality are necessary in any television programme and apply equally in educational television lessons. A television teacher should have natural gifts of attractiveness of personality and the ability to communicate quickly, effectively, and accurately with students. Where possible the presenter should be experienced in instructing the same type of students whom he is to reach by television. He must be able to judge the reactions and responses of his audience, even though he cannot see them or feel their presence, and they in turn must accept and repond to him at a distance. He must be able, from his experience in the classroom, to judge the level and pace of his delivery and to do so with complete confidence, even though he lacks the normal two-way channels of classroom communication.

The keynote of the presenter's personal attitude should be confidence. He must be poised and confident on the air. He must be a dominant, not a retiring personality. He should not be overwhelmed by all the technical facilities, but should be curious and flexible enough to work efficiently with technicians and production personnel.

A suitable voice is naturally a vital part of effective presentation. A clear, resonant and relaxed voice is desirable. The voice should have a natural flow, a conversational tone, and should be accompanied by gestures and movements natural to the performer.

A good presenter does not operate professionally on blind faith, but continually attempts to audit his own performance, watch student responses, and be ready, at the last minute if necessary, to modify what he has been doing to increase the effectiveness of his efforts. In other words, he should be willing to take enlightened risks with his own talents and remain adaptable.

Chapter 4

Graphics and design

Beverley Clarke

A further strand of activity with which the producer has to concern himself is that of graphic design. Here, unlike the activities of script-writing and presentation, he is very much in the hands of specialists; he has to learn how to explain his wishes, and offer ideas for graphic presentation, but for actual realization he must trust his expert advisers. The same position is true of other services, such as technical planning and filming, which are elaborated in later chapters. This kind of decentralization will test the skills of the producer—as manager, co-ordinator and leader—to the full. At the same time, it is important for all members of the production team to understand the fundamentals of technical and design functions, so that a genuine two-way communication can take place, with all programme contributors working to a common goal.

Constraints of the medium

Since the sound component of television is of a comparatively high standard, the technical constraints most often concern size and quality of the visual image. Furthermore, ETV programmes are often viewed in situations which radically affect the legibility of scenic and graphic materials. Even in the home, television screen-size will probably be no more than 21 in, while the larger monitors employed in classrooms or lecture theatres will inevitably be placed farther away from the audience. In this case, maximum and minimum viewing distances can be calculated in order to ensure that students seated farthest from the monitors have equal access to information displayed on the screen.

A rough calculation commonly used to establish maximum and minimum audience viewing distances runs as follows. The maximum distance will be no farther away than twelve times the screen width, and the minimum distance no nearer than five times. For example, if the receiver has a 21-in screen the maximum viewing distance will be 21 ft and the minimum distance 5 ft.

Even working within these limits, the television screen will appear to its audience as only a small area, and the designer must exercise his ingenuity to discover ways of presenting often quite complicated educational material in a space which occupies only a small fraction of the student's field of vision.

The proportions of the television screen are always in the ratio 4 : 3. This invariable relation is called the "aspect ratio", the larger of the two figures always referring to picture width and the smaller to picture height. It imposes yet another constraint on the educator, who must design all his visual information to fit the slightly oblong format.

Another difficulty is imposed by those factors involved in transmission and reception which cut into the full area of the aspect ratio as it leaves the studio. On some misaligned receivers there may be a loss of up to 20 per cent of the original picture area. The amount of "cut-off" varies considerably from country to country and from system to system, but always the ETV designer must discover his "safe area" if his work is to be seen in its entirety.

The television picture itself is built up from a series of fine, horizontal lines. According to the country, there may be 405, 525, 625 or 819 lines, but in all cases the line-structure limits the "resolving" power of the medium. This term refers to the ability of a medium to reproduce fine detail. The lines on a television receiver are narrow enough to avoid distraction to the viewer, but wide enough to compel certain basic rules of graphic presentation. Elaborate styles of lettering, for example, are not used in ETV because most of the detail will be lost and the legibility of the word may even be threatened.

The line structure also limits the sort of patterns that can be used. Those composed of close horizontal lines or small dot formations will produce a flickering and distracting effect called "strobing".

The gradation of tone between black and white which television cameras and receivers are capable of reproducing is known as the "grey scale". A high-quality television system may distinguish as many as twenty different greys, but the average is eight to ten steps between white and black. ETV artwork will frequently incorporate only five tones, to ensure maximum differentiation—often a test of a designer's ingenuity. The use of colour television eases this particular problem, though care must be taken when colour programmes are also viewed on monochrome receivers that colour values relate to the grey scale.

Television cameras often require high levels of light intensity. Even with carefully positioned lighting, attention must be paid to the selection of surfaces and textures used in scenic and graphic design. Non-reflective surfaces will prevent information loss through the reflection of light into the camera lens (flare). Artwork will be prepared with matt paper and paint.

Since television is a comparatively costly medium to be used in education, programmers will tend to pace the flow of information rather quickly. Graphic materials are then required to make a fast impact on a small screen with a poorish quality picture, using a limited number of tones.

All these constraints may appear daunting to the newcomer. But television designers have attacked these problems with enthusiasm and often with a considerable measure of success, and the remainder of this chapter deals with some of the basic techniques which they employ.

Studio displays

In ETV, graphic materials often play a crucial part in the educational effectiveness of a programme, so it is essential that they are displayed for the television camera in the most advantageous fashion possible. Consequently a large proportion of space in an ETV studio will be devoted to display equipment.

The most basic device is probably the

caption stand, which is used to hold graphic cards at a height convenient for the camera (Fig. 4). For reasons to do with lighting and the camera lens, the most convenient size for the caption cards is 12 in by 9 in. (Note that the ratio is still 4 : 3.) This size is ideal for static shots, but if the camera is to track or pan over the card, larger sizes may be used—maybe 20 in by 15 in or 30 in by 20 in. For these larger cards a device called a "strap easel" is sometimes used, where the caption is held in place by webbing straps which are attached to weights (Fig. 5).

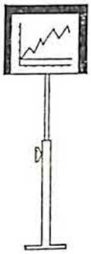

FIG. 4. *Caption stand.*

Strap easels are certainly essential for use with studio animations (see below) which must be held firmly while an operator pulls or pushes sliding tabs.

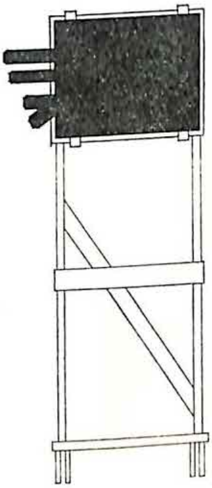

FIG. 5. *Animation stand.*

Another useful stand is known as a "roller caption" (Fig. 6), and is most commonly used for end credits or cast lists. It comprises a roll of paper, usually 12 in wide, on which lettering has been printed. Driven by an electric motor, the paper unwinds from one roller on to another, while the camera remains stationary. But hand-manipulated versions can also be locally made (though they require practice and a steady hand from the operator).

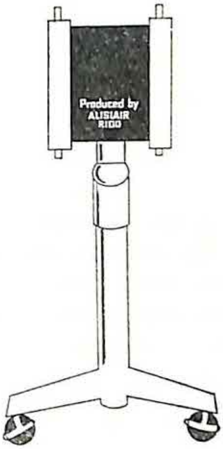

FIG. 6. *Roller caption.*

ETV programmes will often require the use of large-scale graphic materials, where the presenter will need to point to particular areas of detail and where the camera will explore the drawn information by tracking, panning or zooming. Sometimes the teacher will manipulate magnetic pieces on a diagram. For these purposes graphics can be mounted on large display boards, maybe between 3 ft by 2 ft and 8 ft by 6 ft in size. With displays of this size it is advisable, for aesthetic and practical purposes, to construct a set which will serve as an integrating principle for all visual information in the programme.

The surface of a display board can be constructed from any of a wide variety of materials such as painted plywood, painted tin-plate (to which magnetic pieces will adhere), or formica surfaces which will not require paint. In all cases, however, the surface must be even and non-reflective.

Large areas of black should not be used on these displays, particularly if the presenter (or part of him) is to appear in the same shot, because the studio engineers will then find difficulty in producing an acceptable electronic image. Sizeable areas of white will also cause problems.

It should be emphasized that although caption stands, roller captions, etc., can be purchased ready-made from a manufacturer, they are often expensive, and smaller services in particular should be ready to experiment with locally designed and assembled articles. There are no infallible "rules" for the design of graphics furniture, and improvements can be made through trial and error. The best approach is to put a particular problem to a carpenter, and allow him to experiment, being careful to try out his solution on camera, with a skilled operator present, before the work is finalized.

Other effective devices for combining pre-prepared graphics with additional drawing by the presenter during the programme can also be specially invented. For example, the teacher may draw with a wax pencil on a self-illuminated (side-lit) perspex sheet, which is mounted directly in front of prepared artwork; this kind of combination can be worked out by producer and designer in concert.

Financial considerations or insufficient work time may preclude the preparation of large-scale studio displays. If this is the case, an alternative can sometimes be found in the form of a projected image. For example, an ordinary overhead projector can be used to good effect in projecting large images from transparent photographic material. This method is particularly useful with mechanical or architectural drawings, and again the presenter is able to make his own additions with a wax pencil.

Figure 7 shows a purpose-built studio device which employs the same principle, through the image is not projected. A mirror is placed at 45 degrees to an illuminated glass sheet, and the television camera picks up what the presenter writes, via the mirror.

Large visuals from a small original can also be achieved with back-projection equipment. This consists of some kind of high-powered projector throwing an image of a slide on to a translucent screen. The television camera will view the screen from the opposite side, and a presenter will be able to point out details on the screen. Because of the magnification involved, slides for back-projection have to be prepared with

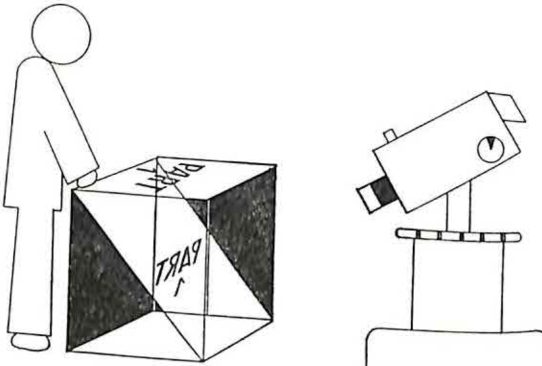

FIG. 7. *Mirror-writing device.*

extreme care, and must be kept dust-free. A back-projector will usually hold several slides (commonly 5 in by 4 in glass slides) which can be changed during the course of a programme. On expensive machines with precise registration pins, animation sequences can be produced by dissolving rapidly between one slide and the next. Back-projection is also a cheap way of producing large photographic blow-ups.

Although effective back-projection systems can be built around simple 35-mm slide projectors, more sophisticated machines involve considerable capital outlay. Also, unless they can be stored elsewhere, they will occupy a large area of often valuable studio space, even when not in use. In addition, they also complicate studio lighting procedures.

Obviously enough, modifications and elaborations of all these studio display devices are to be found in every individual studio, for equipment is bought or built for particular purposes and standardization is useful only to a certain point. However, not all display machinery is located within the studio itself, and the items described below do tend to be more uniform.

Slide-scanners (or telejectors), are used for including 35-mm photographic slides in a programme without projecting them. Usually two projectors, each carrying up to thirty-seven slides, are built into the system, which also includes a fairly simple television camera. An optical device enables the camera to look, in turn, at the illuminated slides in both projectors. The slide change and shutter mechanisms are operated remotely from the studio control room, as is the lens which controls the amount of light reaching the camera. Cuts and dissolves between slides can be achieved and, again, sequential animation can be accomplished by rapid slide-changing.

Other forms of scanner employ graphic caption cards of varying sizes, rather than slides, but the same principles are involved.

A great advantage of the slide scanner lies in its capacity to display graphic materials without tying down a studio camera. However, to offset this, there is a certain inflexibility compared with a normal studio caption, since there can be no last-minute adjustment to the framing. Once the slide is mounted (and this needs careful attention, as slight misalignments are magnified several times) the position of, say, lettering in the frame cannot be altered.

Another machine to be found off the studio floor is the vital telecine chain. This converts the images of standard cine film into the electronically scanned television picture. The use of film in television is described later, but for ETV designers it is interesting primarily as a display device for animated film (see below). Its main disadvantage as a graphic display is an inevitable loss of resolution owing to film grain in addition to the television scanning lines.

Basic principles of layout

Apart from general aesthetic considerations, the functions of layout in ETV graphics are: (a) to counteract the constraints of the medium outlined above; (b) to present information in a form such that the eye is directed naturally to important parts of the picture; (c) to present information in a style which can be readily understood by a variety of students.

Clearly none of these objectives can be fully achieved unless the designer is aware of the teaching aims of the programme and unless he is permitted some degree of interpretation of visual material. He must be familiar with the concepts which are being developed, so that he can advise the director on how to represent them in visual terms. He must also understand the relative importance of the various details on the diagrams in order to direct the students' attention to the vital elements.

Designer and director should agree with each other on the way graphic materials are to be used in the studio. Does all the information need to be legible if the camera is taking a two-shot of a presenter at a display board, or will the detail be covered with a close-up of the graphic? If so, what is the exact area that the close-up will cover? Are camera movements required over a diagram, or will it be necessary to use split-screen or other visual effects (see below)? This sort of information is essential for the designer before he begins to plan the layout of the material.

With only a limited area available for display of information, it is essential to be able to place graphic material exactly where it will be most effective on the television screen. This is not the function of the cameraman, who will line his picture up either to marks which the designer has provided on the outer areas of caption cards or to areas of studio displays which have previously been agreed between director and designer. So the onus for placing graphic material within a frame is clearly with the designer, and he can do this only by being able to find the centre point of the card or display board and orient himself from this. This does not imply that all information needs to be "centred up" or symmetrical in appearance; indeed it is often more effective, especially with lettering, to work off-centre. But this obviously cannot be achieved unless a centre point is first established.

In general, spaces between graphic elements must be accentuated for television presentation. This will mean, for example, that type faces will appear blurred from a distance unless the spaces between letters, between words, and between lines are greater than we should expect on a printed page.

Effective layout will also depend on more abstract considerations, particularly on those concerned with conventions of symbolization. In the first place, there must be a logical consistency in the use of various notations. That is to say, if a particular colour, shape or type face is used to denote a diagrammatic element, the same notation must be applied when that element reappears. Failure to observe this rule will soon lead to confusion in a medium where graphic information must often be broken down into a series of successive images.

The number of separate elements that can be effectively combined in one diagram is dictated to some extent by the nature of the medium and by the subject-matter, but the general consensus is that a relatively small number of elements will have the greatest impact.

Lettering

Because teaching material has a high information loading, lettering will be a widely used graphic component in ETV programmes, its main functions being: (a) to emphasize unfamiliar words, or definitions in the verbal script, often by superimposition; (b) to label models and diagrams; (c) to be used for mathematical or other notations; (d) to credit programme participants, either superimposed or in opening and closing titles.

For the sake of clarity and speed of assimilation, lettering employed in television is usually in some form of printed type face.

The factors governing the choice of type face and size will be largely concerned with the constraints of television. Its limited resolution ensures that type with very thin strokes or elaborate detail will be illegible. Moreover, television "cut-off" greatly reduces the working area. To counteract this, a slightly condensed type face can be used which will accommodate more words per line. The size of the television screen and relative viewing distances will determine the minimum type size to be used. For example, in domestic viewing conditions the minimum type size should be no less than one twenty-fifth of the total picture height.

Choice of type faces and sizes will also be affected by their function. There will often be more freedom for the designers in the preparation of title sequences than elsewhere. Type for superimposition must be bold and simple to stand out against a tonally varied background. On diagrammatic work the choice will be made according to the importance and function of lettering the whole.

In other words, lettering may be used to label the whole diagram, or parts of the diagram, or the lettering itself may be a diagrammatic component. Labels on models and on large-scale graphic displays will depend on the camera shots selected. For example, on a display which is to be shown in a medium shot with the presenter, labels must be much larger and bolder than would be employed on standard captions. In the case of mathematical notations, the selection of type style will be determined by the legibility of each character on the screen. The layout of notations will also have to follow the conventions established for displaying notations in printed books.

The limitation on the amount of information which can be displayed simultaneously on a television screen is particularly inconvenient to the mathematician. Although he will tend to work sequentially, he is often anxious that a student should be able to refer back to any point in the workings of a solution. The designer must work closely with the teacher in order to decide how the information can be broken down into smaller segments. Even long equations must be treated in this way so that a large enough type size can be used.

The choice of styles and sizes will not always be an entirely rational procedure. There is an aesthetic dimension to much graphics design which is difficult to formulate in terms of rules, since it is part of a creative process. A designer's aesthetic sense, his "feel" for what is an appropriate style for any context, will be an important factor in the success of a programme, and the producer must allow him freedom for experiment.

More clear-cut decisions can be taken with regard to techniques for physically producing the type. The main factors here are cost and the amount of work produced.

A method commonly used in ETV organizations of all sizes, from national networks to the smallest closed-circuit system, is the letterpress transfer technique (commonly known as Letraset). The letters are purchased printed in rows on a translucent sheet of thin plastic. By burnishing down the letters they can be transferred on to the artwork according to a prepared layout. The main advantages of the transfer technique are: (a) a wide variety of type styles and sizes is available; (b) the letters will adhere to almost any firm surface; (c) the letter forms are crisp in outline, so that photographic enlargements can be made without indue loss of quality; (d) no capital outlay is required for the purchase of expensive equipment.

The principal disadvantage is in the fact that for repetitive work—such as the preparation of large numbers of similar captions—it is time-consuming and (since labour is the most expensive resource in a graphics budget) often uneconomic. Additionally, the costs of materials have recently risen considerably.

A reproduction method which avoids this charge is the hot press machine. This operates on the principle of heat and pressure. Lead type is heated and pressed face-down on to thin plastic foil which covers the caption card. Pressure and heat then leave an impression of type on the card. This method has proved to be extremely fast and economical where there is a large volume of work, but operation of the machine does require a fairly high level of skill. Moreover most machines will not accommodate card or paper much wider than 20 in. There will also be a high initial cost for purchase of the machine, though unit costs of the finished products will fall.

Lettering can be reproduced by stencils or by hand with brush or pen. Both are, however, very time-consuming and require a high level of skill.

Where special typographic effects are required (particularly distortion of the letters) photosetting can be employed. The letters are stored on negative film and printed by normal photographic techniques. The method is usually considered too expensive for more than occasional use by ETV establishments.

Perhaps in the near future many of the methods outlined above will prove to be unnecessary by the extensive use of the electronic type-face generator. This is a device which has the capability of memorizing a type face by electronic means, to be recalled directly on to a television picture by typing the words out on a keyboard.

Diagrams

Diagrammatic work in ETV will generally fall into one or two broad categories. The first we may term "pictorial" because the intention is to represent the physical characteristics of some aspect of reality. Pictorial diagrams, like all visual representations in art, work on the principle of abstraction: selected objects are abstracted from the complex web of reality, and represented in some conventional form. The degree of abstraction varies considerably. For example, in a diagram of a familial object such as a car engine, we can easily appreciate which conventions of representation have been employed. But a diagram illustrating a sociological view of an individual's relationship to his society shows not only a greater generality of concept, but a parallel abstractness in representation. The components in the diagram have lost any direct relationship to life, and become symbols which we recognize because they have a few features in common with their subjects.

Taken to a logical extreme, abstraction will lead to our second category, which is concerned with mathematical or other notations. This will include graphs, statistical tables, mathematical formulae, and so on.

Creating a style for diagrams in ETV requires the same careful consideration of educational objectives as discussed earlier. In the case of notational diagrams, choice will be limited by demands for legibility, but pictorial work will give the designer greater scope for imaginative interpretation. This might imply choosing the degree of abstraction to be used, or creating symbols to represent abstract ideas.

Once the style and layout have been chosen, diagrams will be prepared in the least time-consuming and least expensive ways possible. With captions, it is usual to prepare the artwork directly on the card, rather than mounting it on a separate piece of paper. Pencil guidelines should not be used when aligning type or pictorial elements, because when these are erased, some of the card surface will probably be removed, and this will cause shine or tonal variation in front of the camera. Paper guidelines can be used instead.

The ETV designer will always be trying to reduce preparation time, and his choice of materials will reflect his concern. For example, glue will often take too long to dry, so double-sided adhesive tape can be used in assembling diagrams. Similarly, where large areas of flat colour are required, cut-out pieces of coloured paper will be used in preference to paint. Nevertheless, it is important not to have too many layers of artwork on a caption card, as it may easily get damaged when sandwiched between others on a stand. Also, it might be difficult to light evenly.

When the artwork is complete, guidelines should be marked on the caption to enable the cameraman to frame up quickly.

Artwork for large display boards is also best prepared straight on to the final surface, but the layout can be planned at a more convenient size on the drawing-desk and then "scaled-up" to larger dimensions. Light chalk marks (easily removed) can be used as guidelines.

Drastic methods of preparation need to be used when working on this large scale, if time and money are to be conserved. Cut-out paper shapes can be used for the different tonal areas, narrow self-adhesive tape can be used instead of drawn or painted lines, and so on. In the case of very large display boards, it may prove advisable (if the equipment is available) to prepare the artwork to scale at a more convenient size for photographic enlargement, which can then be mounted on the display board.

Magnetic diagrams are prepared on boards with a painted tin-plate surface. The basic artwork is prepared straight on the board, while the magnetized labels or movable shapes are cut out of thin card and backed with a magnetic rubber strip. With carefully concealed magnetic strips, complex build-ups of pieces can be achieved.

Diagrams for display by projection need more finely finished artwork because of the large magnification it will undergo. Artwork for telejector or back-projection slides should be prepared on good quality paper, and as neatly and as flat as possible. Framing lines must be provided for the photographer. Where "white on black" slides are required, the artwork is prepared as black on white, and the photographic negative incorporated into the slide. With overlays for overhead projectors, the artwork is often drawn straight on to the cell; extreme care must then be taken to avoid scratch marks and dust, dry transfer materials being the most efficient way of producing lines, areas of tone and lettering.

Newcomers are often surprised at the coarseness of artwork in television diagrams. The reason for this is, of course, the poor visual resolution of the medium—it is pointless wasting valuable hours preparing neat details which would probably compare unfavourably with bolder shapes when seen on a television screen. This general principle works in favour of the ETV network operating on a small budget, because it means that the equipment and materials involved in making diagrams is not a large financial liability.

Animation and special effects

Animation is frequently used in ETV to explain events that are not visible to the human eye, or to explain abstract concepts. We may need to show the physiology of the central nervous system, the movement of sub-atomic particles, or a theorem in geometry. In the teaching of any event or concept which can be represented by sequential movement there are three main techniques of producing animated graphics.

Film animation

Although expensive, and dependent on relatively sophisticated equipment, film animation is unequalled in its potential for showing any kind of movement or visual effect. Shapes can be transformed smoothly into others and at any speed; many different elements can be moved simultaneously or faded in and out of the picture in exact synchronization with a sound-track. Given time and money anything is possible (as is seen in the more detailed description of film animation in Chapter 7)

Videotape animation

With the increasing sophistication of electronic editing it is now possible to build up quite complex sequences of animation directly on to videotape. Artwork can be prepared in exactly the same way as for film animation; different pictorial elements drawn on registered cells placed over varying registered backgrounds. A television camera is used in much the same way as a film-rostrum camera but instead of being loaded with film stock, the television camera is linked to a videotape recording machine (V.T.R.) loaded with tape. Instead of advancing and exposing film frame by frame by a precise shutter mechanism in the camera, the V.T.R. machine is alternately switched between playback and record mode. This is facilitated by placing an auditory signal on the videotape, which automatically activates this switching system. Thus graphic sequences are produced by recording one piece of artwork, changing the artwork, running the V.T.R. machine in playback mode, which at the editing signal switches into record mode, recording the new piece of artwork, and so on.

This method of producing animation is as time-consuming as film animation, but has obvious advantages in obtaining high-definition pictures as there is no loss of resolution through film processing, and by instant playback one can see how the sequence is progressing.

With increasing sophistication of specially designed video-rostrum units incorporating computerized movements, colour separation overlay, electronically generated type faces, one could almost produce all programme graphics with this one resource.

Animated captions

This is an old-established technique for producing simple animated studio graphics.

Basically the caption is constructed out of several layers of movable black paper panels, which reveal parts of the diagram (drawn in light tones) through cut-out windows in higher layers. When the caption is placed in front of a television camera the background tonal variations (caused by shadows between different layers of windows and panels) can be engineered to an over-all, even black. The panels are pulled away by operators out of vision, producing the illusion that pictorial elements appear from nothing. The range of apparent movement is governed by basic mechanical principles, but to a much larger extent by the ingenuity of the designer making the caption. The more complex the animation, the more fragile it becomes in handling, often taking up valuable studio rehearsal time.

Animated captions can be routed through different technical effects such as superimposition, inlay, and colour separation overlay (Fig. 8). For example, a static background diagram could include a colour-separation overlay (C.S.O.) patch into which an animated caption is overlayed, or a background map could have a white on black animated caption superimposed over it showing shipping routes.

Combinations of this sort enable relatively complex graphic sequences to be built up which are quite economic in terms of materials and preparation time, but uneconomical in studio rehearsal time. When this stage is reached other techniques of animation are more suitable.

Special effects

In television, "technical effects" refer to any method of producing a picture which is composed of the output of more than a single camera. They can also refer to changes in video output achieved by electronic processing of the signal.

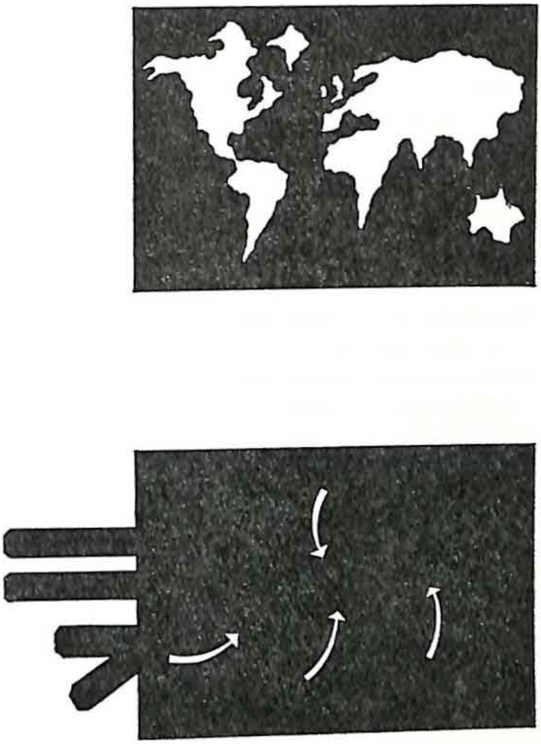

FIG. 8. *Studio animation.*

Technical effects are frequently used in entertainment programmes to create rapid impact or to capture attention. Their use in ETV is quite different, but probably more important.

A widely used technical effect involves the superimposition of the video output of one camera over that of another. More complicated effects are generated with equipment which is costly, but nevertheless, often considered as an essential resource for educational broadcasting. Further consideration of special effects is given in Chapter 6, "Technical Operations" but some of the implications for graphic design are discussed below.

Superimposition is often employed to combine limited amounts of lettering with film or studio output. In cases where cutting away to separate captions would distract from the action or verbal discussion lettering is produced white on black in slide or caption form, and positioned within the frame to relate precisely to the second picture. No attempt should be made to superimpose information over light areas in the original picture. If the source of the second picture is not known, or is likely to change, lettering should be prepared on extra-large caption cards, which will enable the director to choose a suitable framing on the studio day.

Superimposed lettering used to identify programme participants is usually positioned in the lower third of frame, so that in a medium close shot it will appear over the chest.

Superimposition can also be used for building up complex diagrammatic sequences. For example, selected areas on a map can be emphasized by superimposing lettered labels or boundary lines and towns. More ambitious is the superimposition of animated captions, so that moving information from one camera appears over a background diagram from another.

For the designer, an important drawback in the use of this resource is that only pale information can be superimposed, which means that the background picture must be rather dark in tone. The difficulty can be overcome by using another technical effect called "inlay", which electronically inserts part of one picture into another. The inlay machine will embody a pre-transmission monitor displaying the combined picture, and this will enable precise alignment before the picture is selected by the vision mixer. The machine can also electronically convert the inlayed information to black, grey or white, which gives more flexibility in combining lettering with pictures at different tones. If inlay is not used more often, this is probably because of a tendency for inlaid information to suffer from rather ragged edges.

Closed-circuit ETV services will probably produce inlay with a special-effects pattern generator rather than the more versatile matt devices used in broadcasting. Generators can only inlay a limited number of shapes, and the producer and the designer must acquaint themselves with these (as, indeed, with every item of machinery that will impinge on their efforts).

Generators can also produce wipe patterns for replacing one picture with another, an alternative to simple switching or dissolving. Wipes can be moved horizontally or vertically, and if left complete, have the effect of splitting the screen between information from two cameras. For example, it is possible to show simultaneously a scientific experiment and a graphical representation of the results being obtained. We might also use split-screen to compare or contrast two diagrams, instead of cutting between shots. There are many possibilities, but in all cases graphics must be carefully designed for the split-screen format, particular attention being given to the cut-off area.

Overlay is a similar device to matt inlay, except that here the subject itself acts as the inlay mask. In colour, it has several exciting studio applications, but its most common application in ETV is to electronically "black edge" lettering on captions or slides. This gives the letters a solid, three-dimensional appearance which distorts the typographic style, but makes it legible over light areas of a picture.

Photography

The graphics department of any ETV network will possess some photographic equipment, and often a specialist photographer. The role of photography in educational programming is varied, but there can be no doubt about its importance. It is not the "poor man's cine film", as some practitioners have tried to suggest. In fact, producers will frequently choose to use photographs, not only because they are cheaper and easier to obtain, but because of their unique flexibility in the studio. The pace of cutting, panning and tracking over photographs can be conveniently geared to a presenter's performance.

Sequences of photographs on studio captions can be used to break down a complicated action into a series of easily understood stages, in a way rivalled only by slow-motion film. But even apart from the differential in costs, film might still move too fast for the teaching points being made. Moreover, under difficult lighting conditions, stills might be taken in five minutes, while cine filming could last for hours.

However, it is often convenient to shoot existing photographs on film, particularly with stills sequences involving panning, tracking and cutting timed to music or commentary.

A film editor will then assemble the material. In the television studio, where the stills would otherwise be on caption stands, complicated sequences would involve long camera rehearsals, and a small error on transmission might destroy the whole effect and necessitate re-recording (if that is possible). But stills that have been pre-filmed are run into the programme via telecine in the normal way, with no rehearsal time. Stills shot on film can also be intercut with library footage or other film specially shot for the programme.

It is frequently convenient for the teacher and also aesthetically attractive to incorporate large-scale photo blow-ups (P.B.U.s) into the set. The dimensions will depend on the producer's framing but they are likely to be measured in feet; a semi-standard size is 8 ft by 6 ft. P.B.U.s can be used to demonstrate the correct scale of an object by including the teacher in a two-shot, but more important, complex graphics can be enlarged to a size where the pictorial elements will be legible in a mid-shot with the teacher, who is able to point to them in the course of his exposition.

Although the use of large blow-ups presupposes access to photographic equipment unlikely to be found in smaller ETV production centres, many of the same effects can be obtained with back-projection. Obviously the resolution will improve the larger the slide projected, but where fine detail is not required, 35-mm slides can be used.

A graphic designer starting a photographic unit from scratch should try to buy equipment that can be put to several uses. A good quality 35-mm camera with an adaptable lens system and probably a built-in exposure meter is an essential item. The camera is relatively simple in operation, and economic in terms of film stock. Its aspect ratio is similar to that of the television screen, and can be used to produce slides for teleojection and back-projection as well as in the preparation of photo-captions.

Where large photo blow-ups or slides for wide back-projection screens are required, a camera giving larger negative sizes must be used or there will be substantial losses in resolution. A plate camera using 5 in by 4 in negatives is ideal, though this will be bulky, less portable, and must be used with a tripod.

Colour 5 in by 4 in transparencies are ideal when filming colour stills. The transparency is placed on an illuminated glass platen on the rostrum table and filmed with minimum loss of resolution and colour balance (caused by going through a printing process). Transparencies of a smaller format can be used with a close-up attachment on the rostrum camera which may be more economic in photographic stock when large numbers of filmed colour stills are required. Polaroid cameras are useful to a designer in producing quick colour prints, to include in diagrams, the quality of the prints being quite acceptable for this type of work.

Darkroom facilities for photography in television need to allow for speedy "one-off" prints or transparencies. An all-purpose enlarger taking several negative sizes may be preferred if one person is handling all the darkroom work. Adequate storage space for paper and chemicals is essential, along with an efficient ventilation system. Washing and drying prints is always a problem with a quick turnover of work, and here it is wise to invest in a rotary glazing machine. Prints can be continuously fed into the machine, drying around a heated rotating drum. Where a rapid turnover of photo-captions is expected, a dry mounting machine will save much time, and in the long run prove cheaper than using other adhesives for mounting photographs on card.

Studio design

The basic function of studio design in ETV is to provide a teaching environment appropriate to the subject-matter in hand. The set layout will reflect programme structure in such a way that the teacher can move conveniently from position to position, as dictated by his presentation of information. He may, for example, need to show a series of scientific experiments with limited studio space, and this will need careful positioning of apparatus, so that wherever he moves the cameras can follow. Also, the layout must allow space for caption stands, back-projection devices, and so on, but still position display devices within the teacher's reach when he wants to point to them. Lighting, too, must be considered; no set will be acceptable if any section of it is impossible to illuminate to proper engineering standards.

It is therefore apparent that a large proportion of the studio area should be left free of any construction. This space allows room for manœuvre on the part of a small army of studio technicians—cameramen, sound operators, floor managers, scene crew, etc.—and their equipment.

Studio designers in ETV will often be called upon to provide the kind of set used in general broadcasting. Interview set-ups, for example, are common to both, and the design problem identical: to help concentrate attention of the speakers without leaving them in a kind of limbo, without furniture or other surroundings. Subtle lighting on background textures may help, or a more concrete approach may be attempted, with photo blow-ups or decorative motifs which refer to the areas of discussion.

Educational programmes will sometimes include sequences of drama, and then the set might include realistic environments and lighting, props and costumes. But the basic characteristic that ETV shares with most other forms of programming is that it brings together many diverse elements (photographs, slides, film, studio, action, drawings, models, etc.) into a coherent whole. Studio design must provide a physical context in which such a synthesis can take place.

Some of the set components likely to be found in an ETV studio are as follows:

Flats, made either from fireproofed hessian, quarter-inch plywood, or prepared boarding. They will be built on wooden frames high enough to prevent cameras shooting over the top. Over-all dimensions are likely to be between 8 ft and 14 ft in height and 6 ft to 12 ft wide. Surfaces can be treated with flat emulsion paint, wallpaper, photographic paper, or they can be textured.

A *cyclorama,* made from special cloth and stretched round part or all of the studio, to provide a neutral background. Light patterns can be projected on to it, and if it is evenly illuminated, it will create an impression of limitless space.

Projection devices can also be used to create an environment (see also Chapter 6, "Technical Operations"). By speaking in front of a back-projection screen, a teacher, for example, can be made to appear to be in his laboratory. Projection devices can also be used as displays.

Display units which hold large graphic displays. They can be constructed with several revolving sides or to house perspex writing surfaces in front of prepared artwork.

Model mountings, which will include revolving and stationary plinths and mirror devices for high angle shots.

Lighting. If used creatively this can compensate for short-comings in the set due to financial restrictions, or save the more fortunate designer much time, effort and money by giving the set a more "finished" appearance, which otherwise would have to be provided in construction.

The studio designer will use any or all of these components when he has discovered which visual materials are being used and how they are to be presented. Does the teacher need to be in close proximity to a particular diagram? Will he want to handle a model? Must he stand in a specific position in order to manipulate experimental apparatus? The exact progression of information must be discovered before a set can be designed. For example, the designer must know that there will be three photo-captions following the teacher speaking to camera, followed by the teacher demonstrating a piece of working machinery, followed by the teacher writing up some figures of the machine's performance on a display board, and so on.

The main design job is to ensure that all the visual information (and this includes everything except the verbal content of the programme) is arranged and displayed in the most convenient and attractive fashion. The designer must therefore work from the early planning stages of a programme with the producer, the lighting supervisor who will light the set, and the graphics designer, whose work will be displayed.

Additionally, the same point can be made as for graphic displays: there are no unbreakable rules, except that of success. Models can be made up from inexpensive local materials, sets constructed from whatever is available, not necessarily following an orthodox arrangement of flats or scenic units.

They must always be tried out in advance, on camera, well before they are required.

and before a lot of investment has been put into their construction; but if they work after a trial, there is no reason why they should not be employed. The best way of securing this versatility is through an early dialogue between producer and designer, in which the producer concentrates on explaining the effect which he wishes to see achieved, rather than specifying the ways in which it can be done. The designer is then put on his mettle to come up with an original solution.

Designing for colour

Curiously, the first problem for the designer working in colour is that of monochrome; although the producer is working in colour, he must always keep the black-and-white receiver in mind. In particular, whereas the monochrome camera responds to the brightness of a colour, it does not respond to its hue. Therefore designer and producer must watch out for set or graphic design where the brightness of a set of colours is equal. For example, on the colour set pastel pink, blue and purple may look different, but on the mono set all these colours may appear the same shade of grey. Equally, dark purple or blue may simply appear black on the monochrome receiver, unless the designer has made sure that the brightness, or contrast, of the colours, is different.

White poses a particular difficulty. For purposes of reasonable contrast ratio, pure white has to be avoided, muted shades being acceptable. Busy patterns, typified by small paisley prints and geometrics, can introduce phasing distortion, and must be tested before on-camera use.

Another major design problem is that sets, props and costumes previously acceptable in the more theatric black-and-white medium may not always look real on the colour television set. Detail is far more evident in colour and sometimes the shade and saturation of a costume may change under studio lighting. Whereas previously the producer could squint his eyes and gauge what the object would look like in black-and-white television, it is preferable to check out all design in the studio lighting situation.

Make-up presents one of the most serious differences. Pancake make-ups look pasty and false on colour television; thinner, subtler shading is used, mainly to even out skin tones, such as beard areas. Often certain areas of the face are left without make-up, except for powdering. Lipstick and eye colours are more critical, and testing in studio lighting conditions is again nearly always necessary. False hair, whether it be beards or wigs, is virtually useless if it has been carried over from earlier black-and-white days; gradations in hair colour must be woven into the hair piece. Edges of hair are much more critical, and adhesives show up unless absolutely transparent.

Some points for the novice to bear particularly in mind are as follows:

Scenery

1. The face is all important; next comes the costume; finally the scenery.
2. The least colour is often the best colour.
3. Pay attention to the correct colour perspective between the face and the scenery. Eye-catching colour backgrounds cause distraction. Remember, switching between cameras changes the visual background. That interesting colour that was hardly seen in the wide shot, can sud-

denly become overwhelmingly dominant in colour in the close-up.

4. Everything that is to be seen by the cameras must be lit.
5. Spill light on the studio floor was awkward in monochrome; in colour it can become a focal point, possibly overbright too. Care must be taken that both the correct hue, luminance and saturation values for the studio floor are planned.
6. Paint varies from manufacturer to manufacturer, and often from batch to batch. Decide on the hue and the degree of saturation desired. Then calibrate it to the Munsell Scale values, preferably between numbers 3 and 7. Great care should be taken to ensure that the paint is readily available "on demand" from manufacturers, and that each hue and saturation is properly coded.
7. Furniture and other properties are a source of worry. Upholstery usually comes with the chair or sofa. If the hue and saturation are not what is required, it is well-nigh impossible to get the fabric changed, and it would be expensive to reupholster at that stage. Curtain material presents the same problem.
8. Colours to avoid in design are pure black and pure white. Strong reds tend to break up the picture and degrade it. Some blues are very strident and should be avoided. Deeply saturated colours often reflect insufficient light, especially if they lack sheen, and so they tend to become very dark, even going black. Yellow, on the other hand, stands out and often goes above television white.

Costumes

1. The designer first has to be in agreement with the producer as to what is required by the programme. Next he must liaise with the scenery designer and the lighting director in terms of colour, i.e. hue, luminance and saturation. Decisions taken at this preliminary meeting must be discussed at the first planning meeting and agreed upon. Changes made after this will affect the whole team.
2. It is no longer possible for artists to appear in their own costumes (unless they happen to be correct in every colour aspect). Therefore it is the costume designer who will have to impose his choice on the artist. This could cause considerable resentment, and the designer must use a great deal of tact and persuasion when handling this situation. He has to "sell" his design and colour.
3. As costumes are more readily remembered in colour, repetition can no longer be tolerated. This will result in increased costs, whether for stock, or for hiring charges.

Graphics

1. Careful consideration must be given to the colour of large graphic displays, making sure that the colour of individual units relates to the set in general. Large areas of saturated colour backgrounds for studio graphics should be avoided, unless a gaudy effect is required.
2. Colour studios open up more creative possibilities for special effects, with the use of colour separation overlay (C.S.O.). The presenter or actors can be placed in front of a C.S.O. backing and inserted into any visual setting. Mathematical concepts can be taught by letting the teacher work out an equation by walking in and out of life-sized numerals, or a huge three-dimensional graph. Unusual historical

drama productions might be made by placing the actors within drawn illustrations of the period. In this process, great care has to be taken in lining up pictures of the foreground (the actors) and the background pictures; if, for example, the actors have to appear to walk through a door in the illustration, everything depends upon correct alignment. But structures for displaying large graphics together with the teacher in the studio might be replaced by an appropriately sized C.S.O. backing in the set, into which graphics (either on film, slide or caption) are overlayed. The potential of using colour video techniques for educational graphic purposes is only just being exploited, and a lot of experiment is still to come. But both producer and designer must take this experimentation responsibly and not introduce new techniques purely for their own sake; they must be dictated by the instructional job in hand.

Chapter 5

Technical principles

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Douglas Grant
Jack Moore

Technical planning personnel

Technical planning and operations are another area where much depends upon an understanding by the producer of the nature and potential of the equipment available to him, and of the skills of operational personnel. The contact between producer and technical staff will not be frequent; it will begin with an over-all technical planning meeting, where problems are sorted out and equipment needs specified, and is then likely to be irregular until the time of camera rehearsal in the studio (apart from a brief visit to the outside rehearsal by the technical supervisors in the case of more complex productions). It is therefore extremely important that early discussions are precise, and that the producer's intentions are stated very clearly; otherwise, the studio days will come too late to rectify omissions.

The key men in the technical operation production team are the technical producer (or technical manager or supervisor) and the lighting director or supervisor. These two men play different roles in various organizations, and sometimes their functions over-lap, but for the present purpose the two functions will be regarded as separate positions.

The technical producer is the technical adviser to the producer; his function is to co-ordinate all facilities, to ensure that the production runs smoothly, with the studio production team understanding the requirements of the programme. The lighting director has a different role; his function is to control picture quality, aiming for an artistic picture which does not distract from the essential elements on the screen.

Engineering and equipment

Before we come to technical operations, however, we should say something of the basic principles and equipment involved. No-one would expect a television producer to have a complete understanding of the engineering principles behind his medium, but some basic conception of operations will be of great advantage to him.

Any television complex is divided into a number of separate areas. Some of these house administrative and service departments (graphics, film, photography, design and so on). But the heart of television lies in the technical areas, which divide basically into studios, control areas, telecine areas (for inserting film sequences), recording areas (including videotape or other recording equipement), and test and maintenance areas.

Studios

The studio is the dramatic stage of a television production, where sets are located, actors perform, and microphone booms and cameras are placed.

The floor of the studio is laid to very exact tolerance levels, to allow for smooth movement by studio cameras; the cameras themselves have long cables, which are run from wall boxes (and making sure that cables do not cross, or become entangled, in the course of studio productions, is one of the producer's prime concerns when he plans his shots).

Sets are arranged around the studios; cameras operate in front of, and frequently within, these settings. Above is the lighting grid, where the studio lights are suspended. (Unlike a film studio, where lights are arranged on the studio floor, on telescopic stands, in the television studio all the available floor space is needed for camera and equipment movement).

The nucleus of the television operation is the television camera. More will be said later in this chapter about camera mountings and movement, but something should be said here about the principal camera tubes employed.

The camera tube

Nowadays, camera tubes for studio applications are of two types: the photo-emissive type (of which the long established image orthicon is one) or the photo-conductive type. The vidicon was the most common photo-conductive tube in general use, but a decade ago the lead oxide vidicon (or as it is more widely known by its trade names, the Plumbicon or Leddicon) came upon the scene, and particularly for colour-television applications has virtually replaced the older vidicon.

The image orthicon has, for many years, been standard for high quality monochrome studio pictures but creates many problems if required to be used in colour-television applications. It is also more bulky and is considerably more expensive than vidicon- or Plumbicon-type camera tubes.

The photo-conductive-type camera tubes are able to operate on much lower light levels, if required, but suffer from a very troublesome characteristic called "lag". ("Lag" refers to the effect obtained when scanning brightly illuminated moving objects which appear to leave behind a tail, resembling a comet's tail). The Plumbicon-type camera tube is much less troublesome in this respect than the vidicon, but measures still must be taken to reduce the worst effects of the lag characteristic. One of the greatest advantages of the Plumbicon, however, over either the vidicon or the image orthicon is a reduction in the shading characteristic inherent in the latter tubes. Shading, as the name implies, causes scenes to appear darker over certain areas and unless corrected would be disturbing on moving black-and-white televised scenes, and unacceptable on colour television displays. This and other advantages have made the lead oxide vidicon (Plumbicon and Leddicon) camera tube the most popular for colour television applications and it is rapidly gaining ground in monochrome television equipment.

The control room

The control room is to the television studio what the signal box is to a railway system. It is here that the producer and director sit, viewing the output of the cameras (which are displayed on monitors arranged in a bank), and selecting the transmission picture, cutting from camera to camera, normally according to a pre-arranged script.

Also, in the control-room area (frequently in separate cubicles) are lighting and camera controls, and audio control. The above operations are described in detail later in this chapter and in Chapter 8, "Production and Recording".

The master control area

The title "master control" is a term that is falling from favour in many of the world's television stations, mainly because of the changes in system design philosophies. Whether the modern terminology remains "master control" or "central apparatus area", or any other title, it generally refers to an area which acts as the "heart" of the station. Apart from any other equipment, master control houses the synchronizing pulse generators (S.P.G.s). All studio equipment from which vision signals originate (cameras, videotape recorders, test-signal generators, etc.) rely on the S.P.G.s in order to produce vision signals which are synchronized. With all the studio equipment synchronized to the S.P.G.'s pulses, it becomes possible to cut between various studio vision signals without any disturbance, to "dissolve" from one picture to another, and to perform special effects on the various signals.

The master-control area is the centre for networking activities. Nowadays it generally houses all the switching equipment for the vision sources throughout the studios, often houses the camera power supplies and camera vision processing equipment, all remote from the actual studios and control rooms. Remote-control switching and patching panels are extended through to the control rooms but the actual switching and other control functions occur in the master-control area.

The master-control area is generally a technical area as distinct from a programme-production area, although in some smaller studio centres, programme switching and presentation can be carried out from a suitable control desk in master control.

Telecine

Telecine applies to the area or the equipment used for converting a film image (whether movie or still) into a television signal.

Since so much programme material is already available on film, and indeed much programme material is and will continue to be economically most feasible on film (e.g. news, low-budget productions, etc.), it is necessary to provide equipment capable of as high quality reproduction of the film image as is technically possible.

With many different physical dimensions of film materials available in the world today, it becomes somewhat a problem for the television systems engineer to decide on the equipment to be purchased. Fortunately the television industry virtually world-wide has adopted 16-mm film, with an image format four units wide by three units high as "standard". However, many film companies still use 35-mm film necessitating at least one telecine projector capable of handling this size of film. Other grades of film available are 70-mm, 8-mm and super-8-mm, but only the latter is creating interest as a further contender for television utilization at this stage.

The basic telecine principle is to project an image on to the face of a television camera tube, virtually using the camera tube face as a "screen". This type of telecine usually uses photo-conductive camera tubes because of their size, relatively low cost and their very satisfactory performance characteristics under controlled conditions.

Higher quality telecine pictures are possible using much more sophisticated (and hence expensive) equipment utilizing the "flying spot" technique. This is a very complex system requiring absolute synchronization between the film movement and the television signal. The "flying spot" technique differs from the conventional camera tube principle, in that the image is broken down into elements optically, before being converted into an electrical signal.

Telecine equipment would normally comprise at least two 16-mm movie projectors to enable change-over of programme between reels, and one 35-mm slide projector. The three projectors can "feed" one photoconductive television camera, normally using a system of mirrors or prisms mechanically operated (in a multiplexer) to select the required light path.

Telecine equipment may also comprise a caption scanner for televising graphics, test patterns, titles, or a clock, all of which are conventional requirements in television programming.

Videotape

Perhaps the greater single contribution to revolutionize television-studio operations has been the development of the videotape recorder. Until the videotape recorder became a practical proposition, all recorded television programmes were made on film as kinescopes by the cine-recording (or telerecording) process. This technique resulted in loss of quality when compared to the original studio pictures and took a considerable time for processing.

One of the novel features of a videotape recorder is the use of a rotating video head. It was realized early in the development work, that to record the very high video frequencies would necessitate moving the tape past the recording head at a very high speed. To avoid using vast quantities of magnetic tape, it was proposed to move the head, as well as the tape. Thus a very high "writing" rate was achieved by virtue of the video head recording many tracks across the width of the tape as the tape progressed longitudinally at a reasonable speed of about 15 in per second (i.e. at a speed consistent with current audiotape requirements).

Further innovations in videotape equipment have included the ability to edit videotape by wholly electronic means, similar to the techniques employed in film production but without the necessity of cutting the tape. Whole programmes may be assembled in segments giving the appearance of a continuous production. Additions or improvements can be made to existing programmes by inserting new segments into an unrequired section without any visible disturbances. Even animation is now possible under automatic control.

Slow and fast motion and "frozen frames" are possible using a rotating magnetic video-disc in full colour, and even tape duplication is possible by a magnetic printing method similar to contact printing in photography.

The standard, broadcast transverse-scan videotape recorder takes a 2-in videotape. However, the development of the hitherto domestic-quality helical-scan videotape recorder has recently progressed to the standard of performance required for transmission purposes, and 1-in helical-scan machine facilities are becoming more and more frequent in broadcast studios. They are less costly, very versatile, and should become far more common, as the present investment in 2-in machines declines.

Kinerecording (or telerecording) area

In spite of the introduction of videotape-recording equipment, many television organizations still retain the kinerecording facility. This is the process whereby a television signal is recorded on to film.

Kinerecording equipment is retained by many organizations mainly because it is relatively cheaper to store film recordings than to store expensive videotapes. Also in many instances high-quality recordings for archival purposes are not always necessary, so further justifying kinescopes. Syndication of programmes (i.e. the bulk distribution of television programmes) is often more rapidly and more economically achieved by making one master negative kinerecording and producing any number of positive prints by conventional photographic methods, rather than by making multiple videotape dubbings which is wasteful of time, equipment and materials.

A lot of development work is still necessary to produce satisfactory colour kinerecordings. The basic technique of filming directly off the face of a colour display tube is used, but with rather less satisfactory results than the black-and-white technique. Many other methods are employed for film recording of colour-television signals, but none are as yet considered to have achieved a satisfactory compromise between quality and cost. Whereas the costs have increased greatly for colour film and colour-film processing, the cost of colour videotape recording has not increased greatly since a similar type of tape is used for monochrome.

Outside-broadcast equipment

Outside-broadcast equipment traditionally duplicates the studio facilities, only in a much more confined space. With the exception of a slide or caption scanner, the telecine complement of studio equipment is usually omitted from outside-broadcast facilities.

Thanks to the use of solid-state transistorized equipment, a vast amount of equipment can nowadays be crammed into a modern outside-broadcast vehicle, enabling complex productions to be made off-site. Usually three to four cameras are standard equipment, and the outside-broadcast production facilities extend to versatile vision mixing, switching and special-effects equipment. Mobile videotape equipment is often used so that recordings may be made on the outside-broadcast site.

More often than not, the outside-broadcast programme is a live presentation. Under these circumstances it is necessary to "link" back to the studio. This is usually done with microwave transmitting and receiving equipment. Microwave transmission is the most satisfactory mode of transmission because unlike transmission systems at lower frequencies of operation, microwaves in the ultra-high frequency range travel in narrow beams, virtually in line of sight. This enables transmission without interference to other people and vice versa.

However, the past ten years have seen much greater flexibility in remote photography and recording, beginning in the area of film (with smaller, self-blimped cameras) but soon extending to the electronic field. Portable cameras are carried with back packs, allowing a cameraman to move independently, either recording his pictures on an integral unit, or transmitting them back to the recording van by a microwave link.

The degree of portability which can be secured with 2-in videotape equipment is limited, because of bulk and weight factors. However, where 1-in videotape recorders, or even smaller formats, are used, especially in smaller community services, these factors are less obtrusive, allowing for much improved mobility. The arguments for and against the use of smaller formats are mostly technical, concerned with the quality of the transmitted picture, and are still to be resolved, especially in the larger broadcasting networks. However, in educational television, where services are often smaller, the lighter, more adaptable and less-costly forms of camera and recorder—"minicams" and "port-a-paks"—have a great deal to offer. The use of 1-in machines is mostly in the studio, as an alternative format to the traditional transverse-scan machine, or in the outside-broadcast facility of larger broadcasting systems. With educational systems, the possibilities of smaller formats still are now being increasingly explored.

Small-format technology

The first half-inch video recorders appeared commercially in 1965-66, but the real beginning for small-gauge video technology came in 1966 and 1967 with the advent of the portable, battery-operated video recorder/camera combination which has since come to be referred to as the *port-a-pak*.

The port-a-pak received a warm welcome from experimental and documentary film-makers, for its value as an instant replay tool and as a low-cost medium for experimentation, in which case the reusability of the tapes made for higher efficiency. But the difficulties of exchanging tapes, due to the very small number of machines in circulation and a conflict of standards between manufacturers, produced a situation in which video activities were limited almost exclusively to the production of local tapes for specialized local audiences.

However, by 1970 many owners of port-a-paks, both private and institutional, had begun to seek means of extending the distribution possibilities of small-gauge videotape and the emergence of uniform standards among hardware manufacturers made possible videotape exchange networks. This produced a situation in which those working with half-inch video technology began to demand all of the image-creating and manipulating facilities previously available only to broadcasters—indeed, the video artists and electronic-image synthesis researchers were demanding (and in some cases producing) hardware a good deal more sophisticated than any in existing television-production facilities.

In this same period, film-makers and television producers alike were developing a growing interest in tools for production which were less cumbersome to carry, which required fewer operators, which could cut production costs, and which, when used on location, did not exert such a technological presence that they radically altered the situation or event which they had set out to capture. Many important film directors began working to create *cinéma vérité* approaches to production and, perhaps more importantly, the public began to demonstrate that there was possibly a very real market for such material. The idea of utilizing half-inch videotape material for television-broadcast programming was discussed from the very beginning, but a number of technical problems—some genuine, some imagined—appeared to prevent real progress in this area.

It was finally the coming of cable television in the United States which made large-scale broadcasting of half-inch videotape information a reality. The cablecaster's need for low-cost, locally originated material for distribution to a local audience (combined with the fact that cable transmission does not demand the high technical standard required for radio-frequency transmission), suggested two areas for experimentation: super-8 film and/or half-inch videotape. More recently, the introduction of time-base correctors has made possible the conversion of half-inch videotape signals into broadcast standard signals, thereby permitting half-inch tape to be either broadcast directly or transferred to 2-in or other broadcast standard formats.

Basically speaking, a half-inch video system is a small-scale imitation of a television-production studio. It is only a question of the purpose for which the equipment is to be used which determines the technical details of the hardware. The simplest system one could describe would probably be a port-a-pak with its camera or a recorder connected to a television receiver/monitor for the purpose of copying television broadcasts or replaying tapes. Although there are several manufacturers of the port-a-paks, a number of generalizations about their specifications and functioning may be made.

Portable recorders

These: (a) operate almost universally on 12 volts; (b) have an omni-directional microphone built into the camera; (c) run for about one hour on an internal battery, which may be recharged with the aid of an external unit which doubles as an alternating current power supply; (d) accept spools containing up to a half-hour of videotape; (e) are designed to be carried by one person who may or may not also be the operator of the camera; (f) allow for the soundtrack to be changed, through an audio-dubbing facility; (g) weigh approximately 9 kg with battery.

Portable cameras

These :(a) require power (usually 12 volts), normally supplied through a multiple cable which also carries video and audio signals from the camera to the recorder; (b) have (both audio and video) a trigger switch to start and stop the motion of the tape coupled with a warning light; (c) will function as a studio camera when used in conjunction with a special power-supply adaptor; (d) are supplied with zoom lenses which are detachable to permit the use of standard lenses; (e) have black-and-white electronic view-finders through which tape replay is also possible; (f) have vidicon tubes which are irreparably damaged by even momentary exposure to intense light sources; (g) weigh between 2 and 3 kg.

Television receiver/monitors for half-inch video purposes

These: (a) may be battery operated (12 volts), but battery monitors are rarely larger than 11-in screen and require large batteries for short running time; (b) are switchable between a monitoring and a normal television receiver function.

At a more sophisticated level, the mains-operated video deck (though fully compatible with the portable recorders) offers longer playback time, and slow-motion and electronic-editing facilities.

There are also half-inch editing systems which can interface with more sophisticated editing systems utilizing 1-in and 2-in video recorders and three-quarter-inch videocassettes. A number of small engineering companies have sprung up who offer specialized accessories for portable video equipment, including three- to five-hour batteries, switchers which permit two cameras to be recorded on one port-a-pak via a unit the size of a cigarette pack, and units to permit mixing of images from tape and camera.

A combination of factors has led to the forming of co-operatives in which groups of people pool their equipment and talents to extend their production capabilities. While one person with one machine can produce tapes, editing or more complex production will require a number of video recorders and/or cameras and multiple operators so that this co-operative evolution benefits all parties. Many of these co-ops have grown into community service cable-casting, while others have set up community-access centres to create citizen-generated programming for broadcast television chanels. Some of the possibilities are explored in Chapter 16.

The most recent hardware appearing on the market is primarily aimed at eliminating problems limiting the widespread distribution of videotapes either through broadcast television or through distribution of tape copies. In the former case the development of the time-base corrector (T.B.C.) has been long awaited and is already changing the face of news production. Several small stations are entirely dependent on half-inch videotape for the production of local news material and every major network is currently engaged in research in this field. There have been national colour broadcasts of productions originating on half-inch videotape and in several developing countries broadcasting of national television is done entirely from three-quarter-inch videocassettes (without T.B.C.). Whereas previously a television studio for broadcast purposes was unthinkable for less than $250,000, there are on the air today stations set up on $50,000. In the area of tape distribution the videocassette recorder and the video-disc are beginning to make possible mass duplication at low cost and production of playback units which are both simple to operate and inexpensive to produce. The proper development of the videocassette or video-disc market could make audio-visual libraries a widespread functioning reality, and enormous amounts of specialized software for which there is now no viable distribution system could be widely accessible. Indeed, the video-disc or videocassette is an entirely new creative medium offering possibilities other than and beyond those of film or television.

Other recent hardware developments include cameras which shoot in virtual darkness, small portable colour cameras and recorders, computerized systems for the animation of drawings, and video image synthesizers for the creation of entirely electronic visualizations. Most synthesizers work rather like the synthesizers used in the production of electronic music: constructing waveforms from oscillators producing abstract geometric representations and introducing a new area of visual language.

In the research phase at this time are also such previously unimaginable innovations as colour cameras no larger than a match-box, systems for recording video information on normal audiotape recorders, all-sized television screens which roll up when not in use and numerous systems for three-dimensional television.

Still, for those who are producing tapes from day to day, there are persistent problems which have to be dealt with if one hopes to work with video on an international scale. The most insurmountable of these is the differences in international television standards and the resulting incompatibility of tapes and equipment. First of all there is the basic question of whether the system is based on 50-cycle or 60-cycle electricity. For the small production studio the only possibility of converting 50-cycle (CCIR) tapes to 60-cycle (EIA) is re-scanning, i.e. displaying the tape on a good-quality monitor of one standard and re-taping via a camera of the other standard. While this results in a considerable loss of image quality the sync signal of the copy is in fact that of an original tape—making further copies in that standard easier. This solution, however, is not so applicable to the complex problem encountered when dealing with colour, where in addition to the two basic frequency systems there are three colour systems and camera copying is almost completely unsatisfactory where colour is involved.

It is difficult, and will probably remain so for some time, to make a real description of the state of the art for videotapes. There are so many aspects (all of them continuously developing in unpredictable directions) that no one is in a position to say either technologically or sociologically what place video will occupy in ten years' time. But it has proven itself a dynamic tool for research and for local small-scale information systems, and in the long term is bound to affect the organization of broadcasting in general.

Colour television

It is often implied that colour television is possible using only three colour components, say red, green and blue; and that it is possible to obtain other colours using these three "primary" colours in the correct proportions. In fact, other primary colours could have been selected, but it has been found that selecting red, green and blue allows almost the entire range of colours in the visible spectrum to be reproduced, and these are also phosphor colours that are reasonably easy to produce.

The colour camera, therefore, is required to separate the light from a scene into red, green, and blue components and this is done using mirrors and prisms and three (sometimes four) camera tubes.

The modern colour camera is usually equipped with photo-conductive Plumbicon tubes. The use of these tubes has considerable advantages over the use of image orthicons for colour cameras. Although the image orthicon is capable of producing superior monochrome pictures, it is a very difficult task to obtain three (or four) image orthicon tubes that have the same performance characteristics, as is required for a faithful reproduction of colour.

Plumbicon tubes have the advantage of being able to be manufactured with similar performance characteristics, reasonably good "lag" properties and good resolution, and are considerably smaller than the image-orthicon tubes. This allows the modern colour camera to be made if not smaller than, then at least no bigger than, the old monochrome image-orthicon camera.

It can be shown that light is similar in nature to radio electromagnetic waves but of very much shorter wave length than the radio waves used for communication. The eye responds to these very short wave lengths, and the brain interprets them as colours (hue). When virtually all wave lengths are present simultaneously the brain "sees" white light. White light tends to "dilute" colours (e.g., a red when mixed with white is diluted to a pink). An "undiluted" hue is said to be a saturated colour and when mixed with white light, becomes desaturated. A black-and-white television camera is not able to distinguish between the various wave lengths (hues) and only responds to the brightness or luminance of an object (i.e. the total amount of light of various hues reflected from (or emitted by) an object).

Thus a colour-television system is required to transmit not only brightness information (shades of grey from black to white), but in addition must transmit hue and saturation information as well.

In the colour-television camera, the mirrors and prisms have the ability to pass light of certain wave lengths, and to reflect light of other wave lengths. This is achieved using dichroic filters—an optical process obtained when light passes across the boundary of two dissimilar materials (e.g. air and glass).

By this means, light from a scene may be split up into three paths, red light hues, green light hues and blue light hues. When eventually fed to the individual electron beams in the display tube, the red, green and blue dots are separately "excited" in the same proportion as the outputs of the three camera tubes. The eye is unable to distinguish the individual dots and the brain blends the combined effects of the three dots to produce the original colour.

To mix the colour information with the brightness information prior to transmission is technically not a difficult process, but difficulty arises in the reception of the colour encoded signal at the home receiver. Of the many systems of transmission proposed over the years, virtually three remain, N.T.S.C., SECAM and PAL. Chronologically, the N.T.S.C. (National Television Systems Committee—(United States)) was the earliest successful system and is in use in such countries as the United States, Japan and Canada.

Atmospheric disturbances, reflections (ghosts) and receiver design inadequacies resulted in variable quality colour reception, and subsequent modifications to the basic N.T.S.C. system produced the French SECAM (Sequence and Memory) system and later the German PAL (Phase Alternate Line) system—each claiming improvements in the reception of colour-television signals. These improvements upon the original N.T.S.C. system do not imply that the N.T.S.C. system is obsolete. Subsequent design improvements in transmission equipment and receiver circuitry have resulted in three fiercely competitive transmission systems, each professing certain advantages over the other in the various aspects of colour-television signal generation, processing, transmission and reception.

Chapter 6

Technical operations

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Pat Alexander
Barry Sloane

With this backgroud it is now possible to consider television operations and technical planning. It has already been noted that the producer's contact with technical staff is mostly confined to two occasions: to the basic planning meeting, and to the days in the studio. The planning meeting is therefore extremely important, since if the technical producer and lighting supervisor do not have full details of a production, it is not possible for them to give the producer the facilities he needs.

The planning meeting

For the planning meeting which comes at an early stage of production preparation the technical producer requires the following information about a programme: camera numbers, cable length, camera mountings, types of lenses to be used, microphones—types and numbers microphone booms and methods of mounting, length of cables for microphones.

The above is a basic list of vision and sound facilities in the studio, but many other facilities are also required to make the production run smoothly. Some of these are as follows: vision monitors on the studio floor or suspended with a selected vision source, i.e. studio output, telecine, V.T.R. etc.; public address system; foldback—portion of the programme sound fed to the floor; number of speakers for P.A. or foldback; floor managers' headphones; mixed viewfinder (camera A sees camera B in his viewfinder); type of effects patterns (electronic) on switcher (vision mixing unit); audio special effects (e.g. reverberation); audiotape machines and gramophone; V.T.R. and telecine playback.

All this information should be given to the technical producer to allow him to draft a technical floor plan, showing where they will be placed in the studio. A typical example is shown below (Fig. 9).

Although technical operations are the domain of the technical producer, the lighting director and their staff, it is also important for the producer to have a sound knowledge of television technical operations. Consequently, the following three sections deal with camera operations, audio operations and lighting principles.

Camera operations

The television producer, for the most part, takes electronic systems for granted; what he is interested in is the manœuvrability

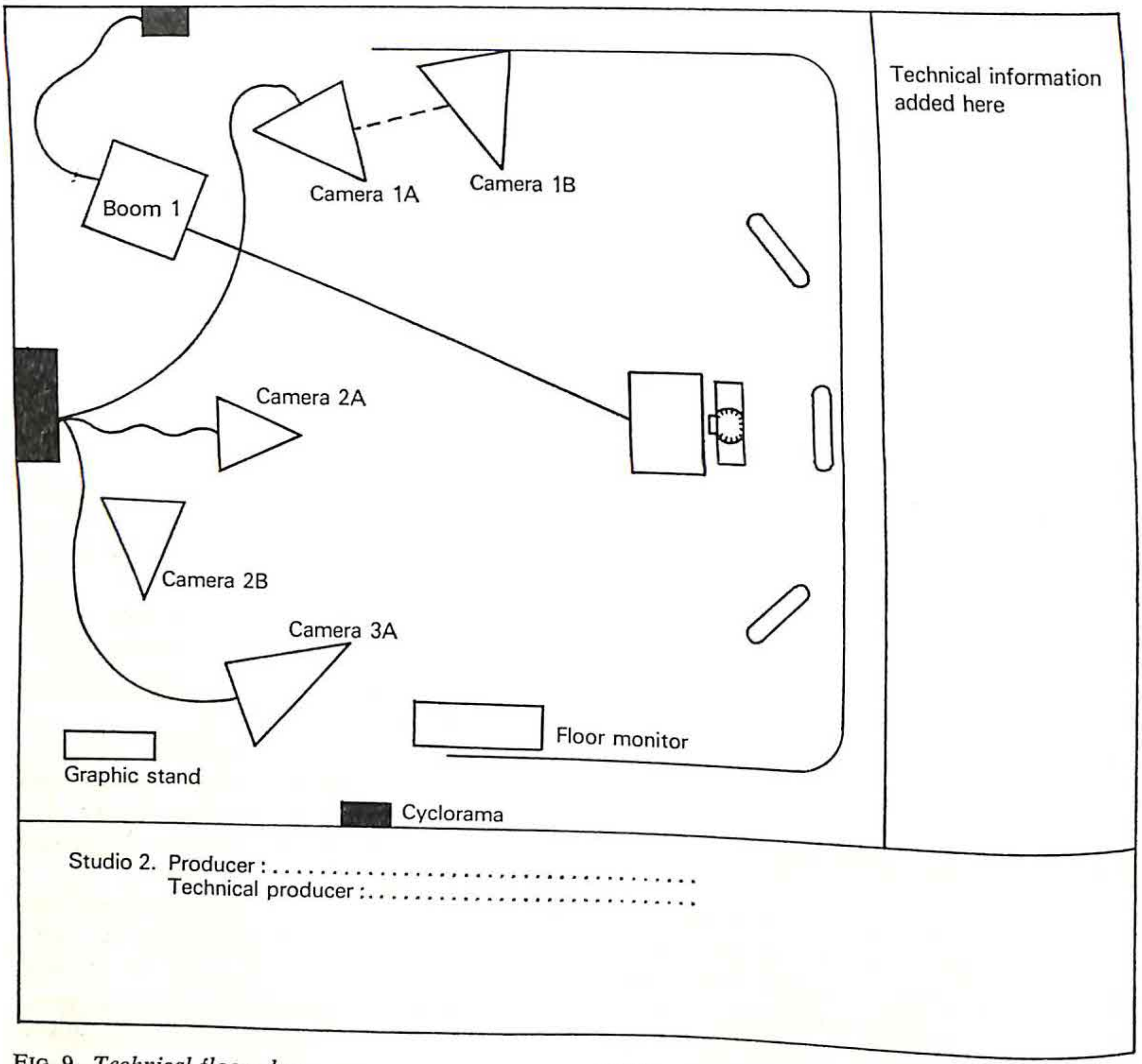

Technical information added here
Boom 1
Camera 1A
Camera 1B
Camera 2A
Camera 2B
Camera 3A
Floor monitor
Graphic stand
Cyclorama
Studio 2. Producer: ....
Technical producer: ....

FIG. 9. *Technical floor plan.*

of the complete camera assembly. Cameras are mounted in a number of ways, ranging from a fixed mount, or tripod, to large cranes, and each allows for a different range of movement. Bearing this in mind, the main camera movements are as follow:

Panning: moving the camera head horizontally from left to right or vice versa.

Tilting: moving the camera head up or down in a vertical plane.

Pedestalling: moving the camera pedestal up and down, so that the whole camera head is raised or lowered, to achieve high- or low-angled shots.

Craning: operating the boom on a camera crane, to produce high- and low-angled shots, or lateral shots. (The term is also used with pedestal cameras, to indicate the raising or lowering of the camera pedestal, i.e. equivalent to "pedestalling".)

Tracking (or *dollying*): moving the whole camera mounting towards or away from the subject.

Crabbing (or *trucking*): moving the camera mounting sideways, in a lateral plane, so that the camera shifts to one or the other side of the subject, and so changes the lateral angle of view.

Zooming: changing the framing size of the subject by operating a zoom lens. This has the effect of altering the depth of field of the subject in relation to his background (i.e. the subject appears successively closer to or further away from the background), as opposed to tracking, where the relationship of the subject to the background remains constant, as the movement is effected on the same lens.

The fixed tripod

With this mounting, the camera is capable of being panned to left or right, or tilted in the vertical plane (provided that it is fitted to the tripod with a pan-and-tilt head), but it cannot undertake any lateral movement. It is therefore only suitable for fixed positions (e.g. a static presenter, or a graphic caption), and its use is mostly confined to closed circuit applications.

The tripod skid (or tripod dolly)

This is the same basic form of mounting as the fixed tripod, but wheels have been added (Fig. 10). These allow the camera to be moved around, though care has to be taken with the actual movement, which is often ragged and may not always produce acceptable tracking shots.

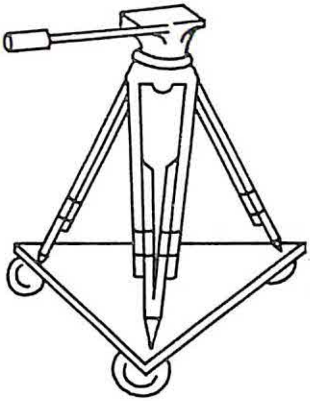


FIG. 10. *Tripod skid or dolly.*

The pedestal

This is still, after many years, the most versatile form of camera mounting (Fig. 11). The camera is mounted on a mobile pedestal, which can be raised and lowered (mechanically or, more often, hydraulically), thus allowing high-and low-angled shots to be taken. Equally, panning and tilting, tracking and crabbing are possible. The camera mounting does not occupy a large

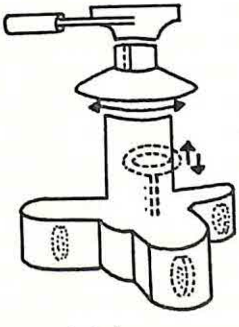


FIG. 11. *Camera pedestal.*

amount of space, and it can be operated by a single cameraman; it is therefore eminently suitable for small studios.

Cranes

Finally there are various kinds of crane mounting. These vary from relatively small cranes (Fig. 12), which can be operated by two people (a cameraman and a tracker), and which give smoother, controlled tracking shots and higher elevations, to more elaborate devices with boom arms, which allow for more complex lateral movements. There are also some large cranes, mostly used in feature-film situations, which allow for extremely high-angle shots. For the most part, except in larger media services, the more complex crane mountings cannot be contemplated; they are expensive to acquire, require several staff to operate, and demand a considerable amount of studio space.

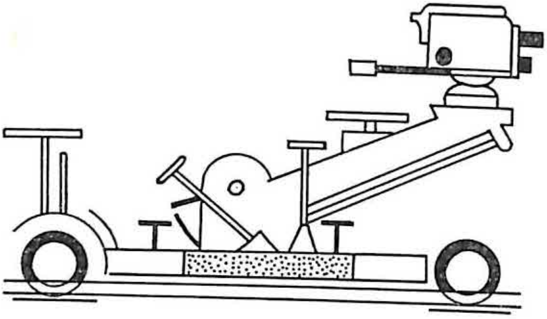


FIG. 12. *Small crane.*

The producer should study the equipment available to him and learn, in particular, the limits of a particular mounting (especially as far as height is concerned); he should also learn how long it takes for a particular mounting to change direction, or to move to a new camera position. He has to earn the confidence of his technical crew, and few things will show up his innocence more than not allowing for such limitations.

Camera lenses

It is the camera lens which determines the size of shot of a subject (as well, of course, as the distance of the camera away from the subject). So, the choice of different lenses will achieve a wide-angle shot, medium shot, or close-up. Traditionally lenses have been identified in two ways: by focal length (long focus, short focus, telephoto, or by "so many inches" or "so many millimetres"), or by lens angle (wide-angle, narrow-angle, or lenses of "so many degrees"). But the use of zoom lenses, which offer a choice of lens angles and the ability to zoom as an alternative to tracking, is making the turret camera largely obsolete in electronic work.

With turret lenses, a different lens could be secured by rotating the turret; characteristic lens angles were 35 degrees, 24 degrees, 16 degrees, and 9 degrees. With zoom lenses, the framing size is determined by changing the angle of zoom (either manually, or with an electrically operated control). Zoom lenses can also be pre-set to different camera angles, if required, so that a simple button control will operate the zoom lens to select a new angle. The most common range of the zoom lens is 10:1 (with angles of 40 degrees to 4 degrees).

There is still some debate as to how frequently zooming should be carried out in vision, although the practice is now well-enough known for the issue to be less polarized. Rapid zooming produces a sudden and dramatic effect, since the background apparently moves towards or away from the subject, as the subject's size is altered; this has often been used as a special effect in drama production. Today, zooming is standard in the cinema, as it obviates the need for expensive tracking equipment, and audiences are much less sensitive to its effects.

Shot sizes

As with camera movements, there is an accepted language in television and film to determine the size of shot. This is normally expressed in terms of the space occupied by the subject in the screen frame, as follows (and as illustrated in Fig. 13):

Very long shot (V.L.S.): The subject, at full length, is small in the over-all frame.

Long shot (L.S.): The subject, at full length, occupies the whole frame.

Medium long shot (M L.S.): The subject is cut below the knees.

Mid-shot (M.S.): The subject is shown from head to waist.

Medium close-up (M.C.U.): The subject is shown from head to chest.

Close-up (C.U.): The head of the subject only is shown.

Big close-up (B.C.U.): The head of the subject is shown, cut at forehead and chin.

For convenience the above description is given in terms of a single, human figure, but the same kind of description is also applied to objects, buildings, etc., inferring the same perspective and dimensions. Equally, in shots where more than one figure is shown, reference is made to a two-shot, three-shot or group shot. Finally, in shots which are framed across a shoulder, or across the front of a foreground object, holding the major subject at the rear of the frame, the term "cross shot" (X-shot) is often employed.

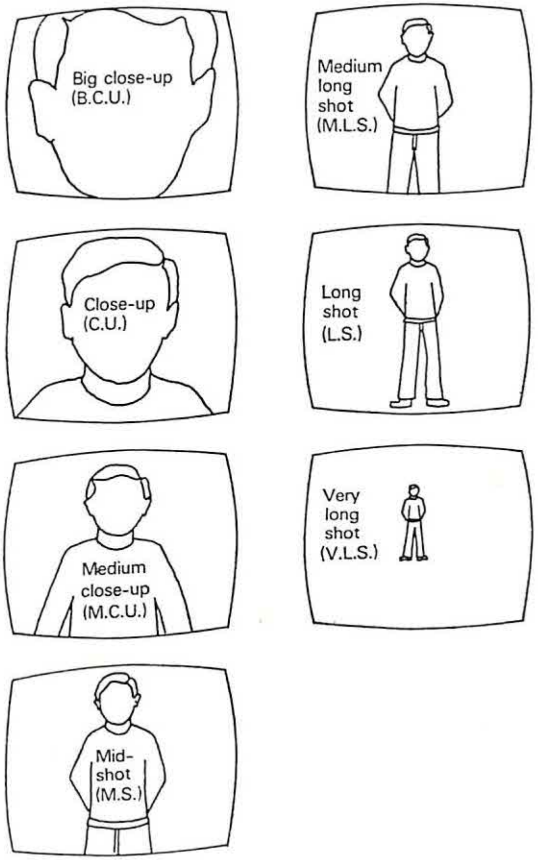


FIG. 13. *Shot sizes.*

The intention of this terminology is not to fix the exact form of framing; this is a matter of individual preference, and good framing becomes instinctive to both cameraman and director. However, it does serve as a handy reference tool, to indicate the general character of the shot to be employed.

Vision mixing

The art of the television producer lies not only in correct picture composition, framing and camera movement, but in the juxtaposition of pictures, as switches are made from one picture source to another. Unlike film (where cutting is a physical matter, involving splicing one picture, or shot, to another), in television cutting is achieved instantaneously in the control room.

The most important item of equipment, from the director's point of view, is therefore the vision mixing unit or switcher. It is this control which allows transitions to be made from camera to camera, to change the picture (ultimately) on the viewer's screen, as he sees the final programme.

Switching procedures will be described later in this chapter, but is important from the outset for the producer to be aware of the basic kinds of movement from picture to picture.

The *cut* is the standard method; it involves an instantaneous switching from camera to camera, so that on the transmission screen a new picture registers at once.

The *mix* is a quick transition from one picture to another, and is achieved by manipulating a rheostat or fader.

The *dissolve* is a slower transition, an extended mix.

The *fade* is a slow elimination of the picture, ending in a blank screen.

The cut is the most regular feature of the language of television; it is instantaneous and passes almost unnoticed by the viewer. The mix is normally used to show some interval of time or space, or to indicate a transition between a live action and graphic source, or between studio and film sequences. It can also be used to punctuate a sequence of graphic of photographic items, helping to create a sense of movement and fluency. The fade shows a more substantial time lapse, or a break between separate pieces of action. The dissolve is used for poetic effects (dream sequences, and the like) where a sense of slowness or unreality has to be generated.

It should be emphasized, howevern, that these are only indications of use, and each director must generate his own style. Indeed, the modern tendency is for the cut to be used in the vast majority of cases; audiences have now become used to relatively abrupt changes of time and place, and the mix or dissolve may appear somewhat antiquated a style. In educational television, however, it can be useful as a means of drawing attention to particular items, or of introducing and punctuating graphic work. In instructional sequences, the producer often wishes to control the pace of presentation, to speed up, slow down, create pauses or emphases, and a range of formats is useful to him in creating such effects.

The art of the vision mixer (or switcher) is a particularly skilled art, and all producers should be familiar with the operations involved. A standard layout for a vision mixing unit is shown in Figure 14, with controls for cutting, mixing and fading. A good deal of precision is needed to determine exactly when to cut from the output of one camera to another—the exact point in a subject's move at which to shift from long shot to close up, without creating a jarring effect upon the viewer. It is for this reason that members of the control-

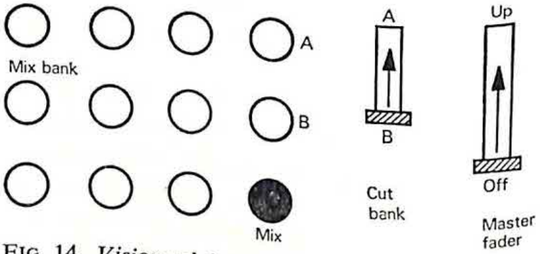


FIG. 14. *Vision mixing-unit layout.*

room staff have available to them pictures showing the output of every camera in the studio, as well as film and pre-recorded tape inserts which are to be used in the programme. In this way, they can preview pictures, to ensure in advance that the right picture is being taken, framed in the correct way. The good producer looks for the most part at his preview monitors; he is not concerned with transmission output, until such time as he can review the completed programme.

Electronic effects

In addition to the above, there are a number of "special effects"; some of which electronically alter the picture signal from its original condition.

Many cameras embody facilities for reverse scanning, which will laterally invert the picture. This is useful in those situations where a camera is seeing a scene through a mirror—high-angle shots of models, certain writing devices like the animation table, and so on. The mirror inverts the original information, while the reverse scanning converts in back to its original condition.

With reverse phasing the grey scale of the picture is inverted, so that white becomes black and vice versa. Most telecine machines possess this facility, so that in emergency they can project negative film and convert it to positive. In the case of graphics such as studio animations, they can be manufactured as white on black (which is usually more convenient) and if necessary, reverse phased during the programme to match tonally with other design components.

The special-effects mixer can supply to the production a large number of electronic effects. The special-effects unit is part of a complete mixer which has a cut bank and an A and B mix bank. When this unit is added to the mixer, an additional lever control and special-effects button is placed on the panel with the special-effects unit (see Fig. 15).

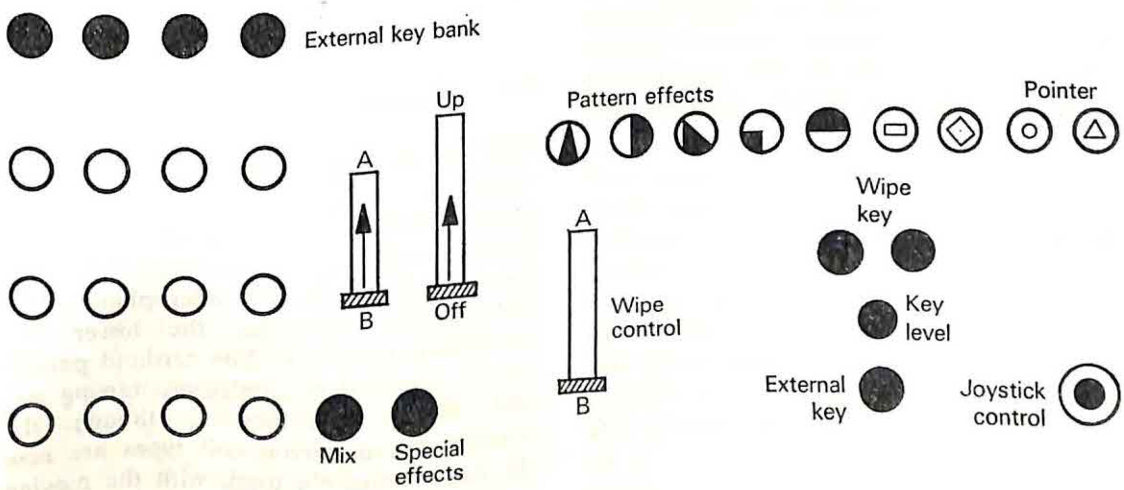


FIG. 15. *Standard mixer with special effects.*

The types of effects that can be obtained from this unit are as follows:

A wipe of one picture to another using various types of patterns: With the use of vertical or horizontal wipes a “split screen“ can be obtained, allowing two pictures to be on the screen at the same time without overlapping the picture. This can be useful where two angles of a demonstration are to be observed simultaneously. Other wipe patterns can be used for transitions between pictures.

Electronic pointer: This is a triangle which can be varied in size and can be moved around the screen by the use of a joystick control. The pointer can usually be made either black, white, or any tone between black and white; it was originally designed for ETV productions.

Key or overlap: The effect allows the mixer to insert picture A into picture B. This is achieved by cutting a hole electronically with a key signal, the latter being picture A.

The effects mixer, when used with discretion, can be very effective, but it should be discussed with the technical producer at the planning meeting, to assess feasibility. As an example, it is not effective to inlay people into another picture, as fine detail such as hair produces a tearing effect in the picture.

Audio operations

Television sound presents a number of problems, the most fundamental being that while good, crisp sound quality is needed, the microphone must be suspended in such a way that it remains out of the view of the camera and does not interfere with studio lighting (by throwing shadows onto inconvenient parts of the setting).

Microphones

There are many varieties of microphone available today, each with different characteristics. The most common type in use is one with a uni-directional pattern which is known as a cardioid microphone. The principles of microphones will not be covered here, but their correct practical application should be discussed.

The cardioid microphone (Fig. 16) is sensitive in the direction in which it is facing, but has a low pick-up from the rear. This type of microphone has a back-to-front ratio of 15 : 1 and above, which will reduce extraneous noises made in the studio, but it only operates at certain frequencies. With the smaller pencil-type microphones, the back-to-front ratio for the lower frequencies is much less. The cardioid pattern can be obtained in condenser, moving coil and ribbon microphones, though the condenser and moving-coil types are now the most frequently used, with the moving coil the most popular of all. Other varieties

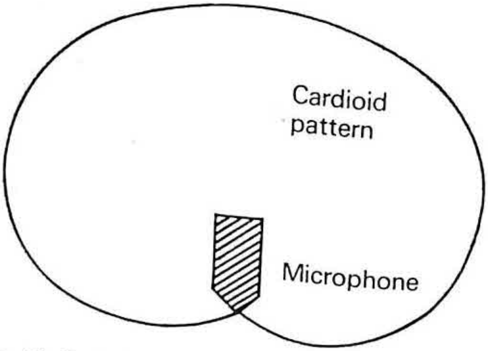


FIG. 16. *Uni-directional microphone.*

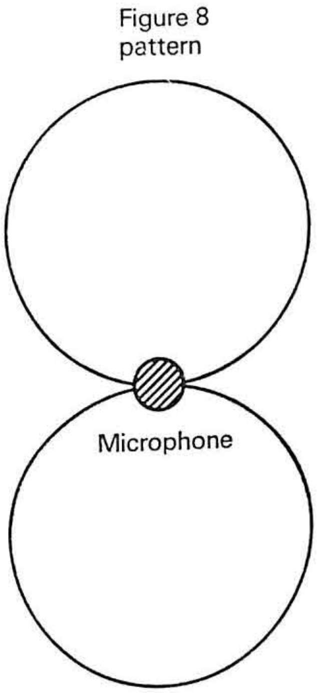


FIG. 17. *Bi-directional microphone.*

of microphones are the bi-directional (or figure-of-eight pattern) and the omni-directional pattern (see Figs. 17 and 18).

Each microphone pattern is used to suit a particular setting (for example, the bi-directional pattern could be used for a two-way interview across a table).

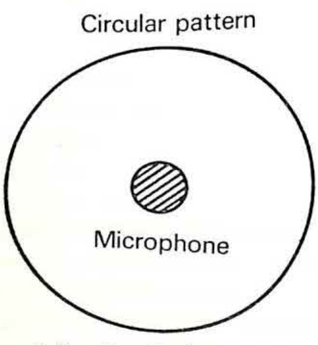


FIG. 18. *Omni-directional microphone.*

Neck microphones and hand microphones are of the omni-directional type, because of their close proximity to the presenter (that is, less than 12 in from the mouth).

Microphone mountings

Several types of mounting are used for microphones: table stand, fixed position; floor stand, fixed position; small boom; extending and retracting large boom; hanging microphone, fixed position; hidden microphone, fixed position; Lavalier microphone, neck microphone.

ETV sound requires flexibility, which rules out some of the above methods. The most suitable types are, therefore, the small boom, the large boom and the neck microphone.

The small boom

The length of this item of equipment (Fig. 19) can be extended or retracted to a fixed position.

The microphone is fixed in a microphone cage and the balance weight is adjusted; the microphone can then be rotated through 270 degrees and the boom arm is panned. There is no tilt control, though other more sophisticated small booms (sometimes called lazy arms) have a tilt control. The small boom has limited flexibility and is only useful in static situations. It is difficult to operate with moving subjects, but requires only one-man operation.

The large boom

This is the most flexible piece of equipment used on the studio floor for mobile sound pick-up (Fig. 20). The length of the boom

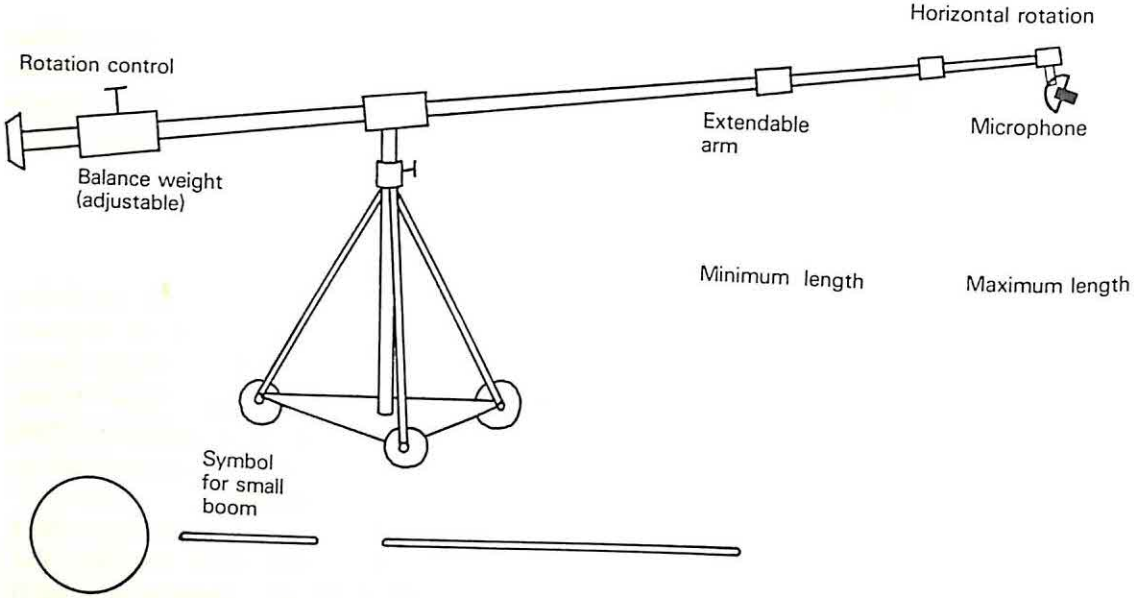


FIG. 19. *Small boom.*

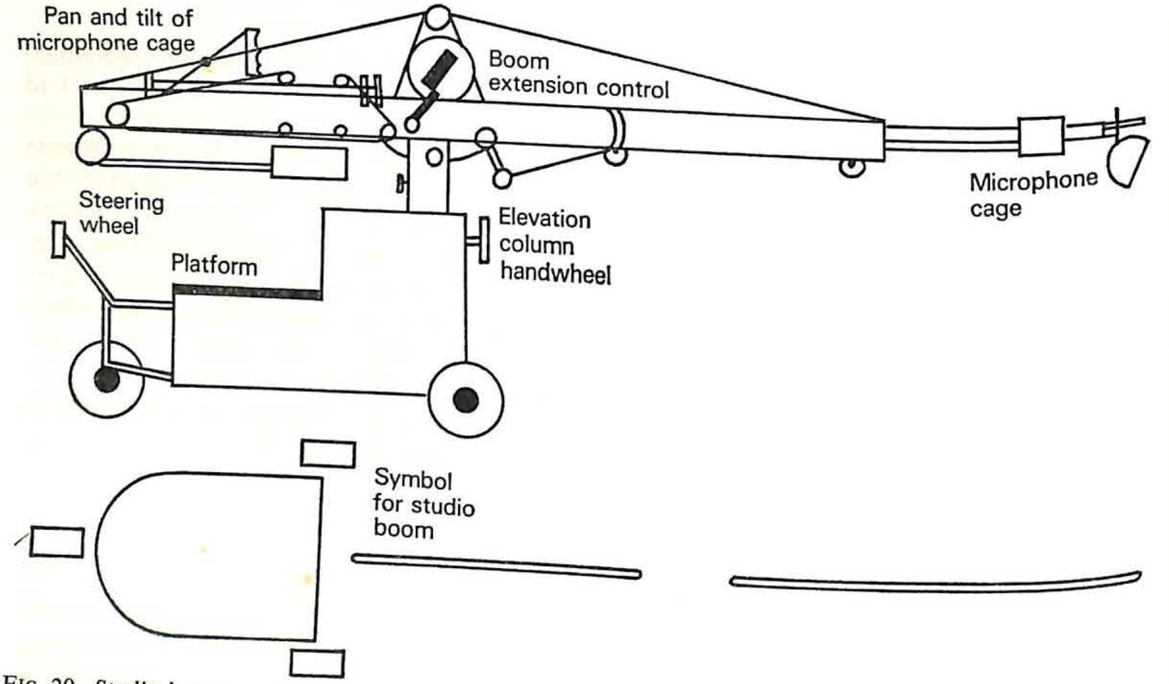


FIG. 20. *Studio boom.*

can be extended and retracted by winding a handle while the counter-balance weight moves up and down the rear tube. The microphone can be rotated through 270 degrees and can be tilted through approximately 150 degrees. The arm of the boom can be raised and lowered and there is an operational platform for the operator (the wheels of the boom are inflated tyres). The boom usually has three wheels, one adjustable for steering to allow for easy positioning during productions.

This type of unit requires a trained operator to keep the microphone in the correct position for maximum sound pick-up at all times during the production. The boom operator must have considerable concentration and be aware of the various camera shots that are being taken.

Boom microphones

There are various factors governing the type of microphone used in the boom.

1. The microphone should have minimum pick-up from the rear (that is, it should possess a good back-to-front ratio).
2. The microphone should have a directional characteristic.
3. The microphone should possess a good frequency response, particularly at the bass end of the frequency range.
4. The microphone should be shock resistant and be unaffected by wind noise.
5. The microphone should be sensitive to sound pick-up.

These requirements are difficult to find in one microphone and various methods have been used to accommodate them in both boom and microphone design.

The cardioid pattern microphone is always used on a boom in the television studio, to reduce background noise caused by the operational equipment and the operational crew. The directional characteristic of the microphone aids in achieving maximum sound pick-up from the subject while the microphone is out of the picture (it should at all times be only 3 ft away from the subject). This is where the skill of the boom operator is required. His judgement in placing the microphone in relation to the subject will actually govern the sound quality of the production since, if the microphone constantly varies in distance, sound quality will not be constant and, in addition, unwanted background noise will surge up and down as the audio-operator compensates for changes in sound level.

With moving subjects, the microphone is racked (that is, extended and retracted constantly throughout the production, changing the position of the microphone with the movement of the subject).

There are two types of microphone which are suitable for high-quality-sound boom operation. These are the moving coil microphone and the condenser microphone. (The ribbon type is now obsolete, though some of these microphones are still in use.)

The moving coil

This is the most suitable unit. It has a wide frequency range and is extremely robust and shock resistant; indeed, it possesses most of the required characteristics for boom operation except that of sensitivity.

The condenser microphone

This microphone is robust but very susceptible to shock and wind noise; its frequency response is excellent and sensitivity extremely high. Additionally, it requires a power supply, and this is an added hazard. Condenser mikes have been used successfully for boom operation, but their operational characteristics must be properly understood. Although the condenser is more sensitive, this does not mean that it can be positioned further away from the subject and still secure the same quality since, although the pick-up can be quite satisfactory, the sound quality will become "off-mike" and hollow. The unwanted pick-up of studio noise is also increased and in some studios, air-conditioning noise becomes objectionable. So the condenser microphone is positioned at the same distance from the subject (3 ft) as any other boom microphone. This improves the sound, as the background noise is significantly reduced (with the signal input level from the subject being greater due to the sensitivity of the microphone).

The boom and boom microphone are a most essential part of the television sound system, as the only effective means available to obtain consistent quality sound from a moving subject. The most convenient position in which to place the boom is shown in Figure 21, where it is positioned in the middle of the set, thus minimizing possible shadows from lighting. The further round the boom is placed toward "A", the more difficult it becomes to avoid boom arm shadow and the more difficulty the operator has in judging the position of the microphone relative to the subject. Naturally, however, in the practical business of production, compromises are necessary.

Lavalier (neck) microphone

This is usually known as a neck microphone and is used when a boom is inconvenient for the production. The microphone is small and gives good speech quality, and the close proximity of the microphone to the speaker gives a good signal-to-background-noise ratio. The disadvantage is that, being worn around the neck, it hangs in front of the subject in shot. The microphone is sometimes hidden under a tie or other clothing, but this is not good practice as it affects the frequency response, causing a loss of high frequencies and resulting in muffled sound. When the subject moves there is also a rustling noise from the clothing. Additionally, the microphone has a cable, which can be a hazard for the presenter if he has movement.

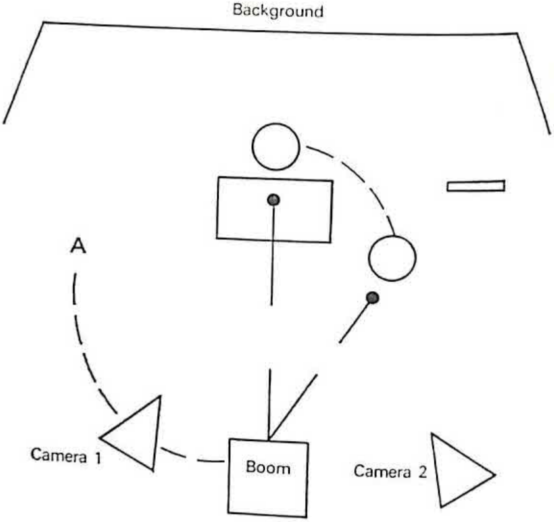


FIG. 21. *Boom placement.*

Lighting operations

In the discussion of lighting which follows, certain basic terms need to be understood:

The *key light* is the main light source for a scene, focused upon the subject.

The *back light* is used to separate the subject from his background.

The *fill light* is intended to light out unlit areas and soften harsh shadows thrown by the key light.

The *set light* is for the setting or decor.

Hard light is such as that thrown by a spotlight, with hard edges.

Lights are suspended from a *lighting grid,* sometimes individually, sometimes in groups, arranged on lighting battens or barrels (Fig. 22). They may be fixed directly to the grid (in smaller installations), or from adjustable pantographs; in larger installations lighting barrels are raised and lowered on hoists, manually or electronically. Lights can be tilted and angled, and doors are fitted to mask off particular light areas, but the intensity of lights is fixed by *dimmers,* which are remotely controlled (normally from the lighting-control area).

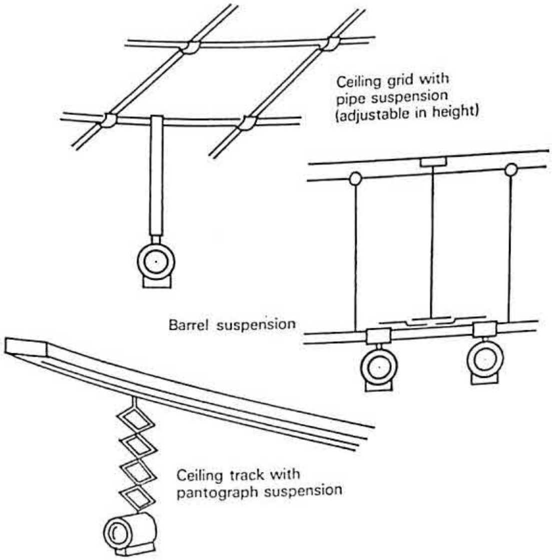

Ceiling grid with pipe suspension (adjustable in height)
Barrel suspension
Ceiling track with pantograph suspension

FIG. 22. *Typical methods of lighting suspension.*

Lighting for educational television

The planning requirements which have been discussed so far are the same for all television productions and ETV is no exception to the rule. In fact, in many cases, more detailed planning is required for ETV than for general programmes and lighting is a particular example. Thus producers should have a working knowledge of lighting principles.

The aim of lighting is to produce a pleasing picture which matches the situation of the production. The lighting director works within certain latitudes to achieve this result.

The diagrams below show the latitudes of placement of lighting equipment for monochrome television.

Placement for a key light

Figure 23 shows the horizontal placement of the ket light. The luminaire can be placed in any position between A and B. The key light is always placed in front of two quadrants; the basic rule relating to the placement of the key light is that the luminaire positioning is relative to the direction the person is facing. The nose is the reference centre axis.

The luminaire can be positioned in the vertical plane between A and B (Fig. 24). The vertical plane adds depth and shape to the protruding parts of the face, to maintain shape and form the minimum angle from the reference plane (which is the head). This is generally considered 6 ft above the floor level for the standing position and 4 ft 6 in above floor level for the sitting position.

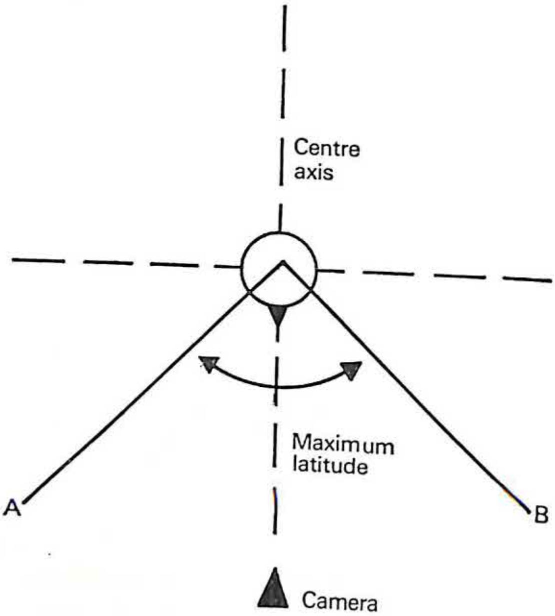


FIG. 23. *Horizontal placement of a key light.*

The back light (horizontal placement)

This luminaire is used to separate the subject from his background. The light placement must be between positions A and B (Fig. 25). To position lights beyond these positions would give an unsatisfactory result, as the light would strike the nose, causing it to look unnatural. The light level should be one and a half times the key light and adjustable in intensity.

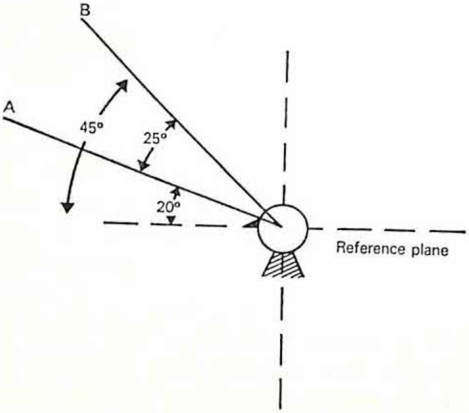


FIG. 24. *Vertical placement of a key light.*

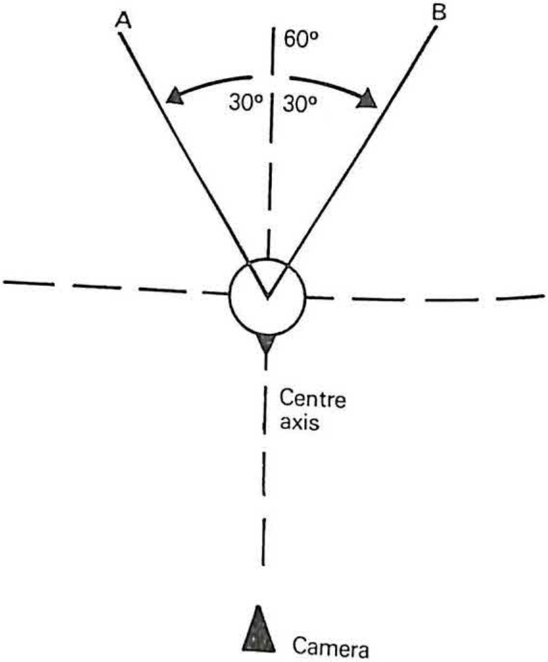


FIG. 25. *Horizontal placement of a back light.*

The back light (vertical placement)

The position in the vertical plane is restricted to a 30-degree range between A and B (Fig. 26). The lowest practical angle is 30 degrees from the reference plane. Below position B restricts camera movement because of flare, and above position A gives unwanted long shadows of the head on the chest and can emphasize the forehead of the subject.

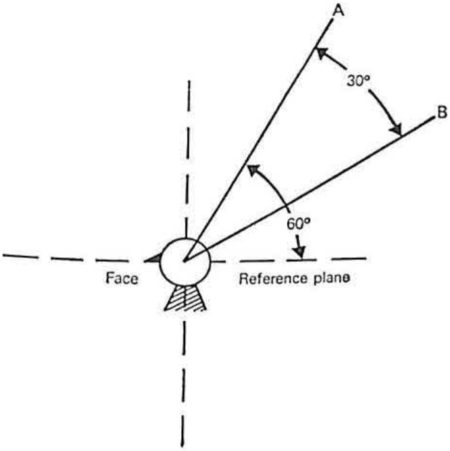


FIG. 26. *Vertical placement of a back light.*

The fill light (horizontal position)

The fill light is always placed from where the camera is looking (Fig. 27). The degree of fill required controls the contrast of the picture, and the minimum light level should be three-quarters of the key light and adjustable in intensity.

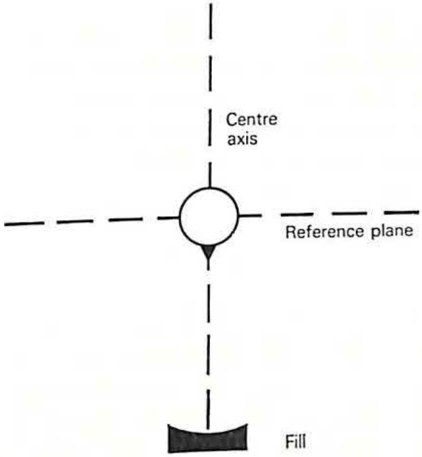


FIG. 27. *Horizontal placement of a fill light.*

The fill light (vertical position)

The ideal fill-light position in the vertical plane is 0 degrees at the reference plane. The most practical is between A and B at the 15-degree position (Fig. 28). If the luminaire is placed above A it no longer

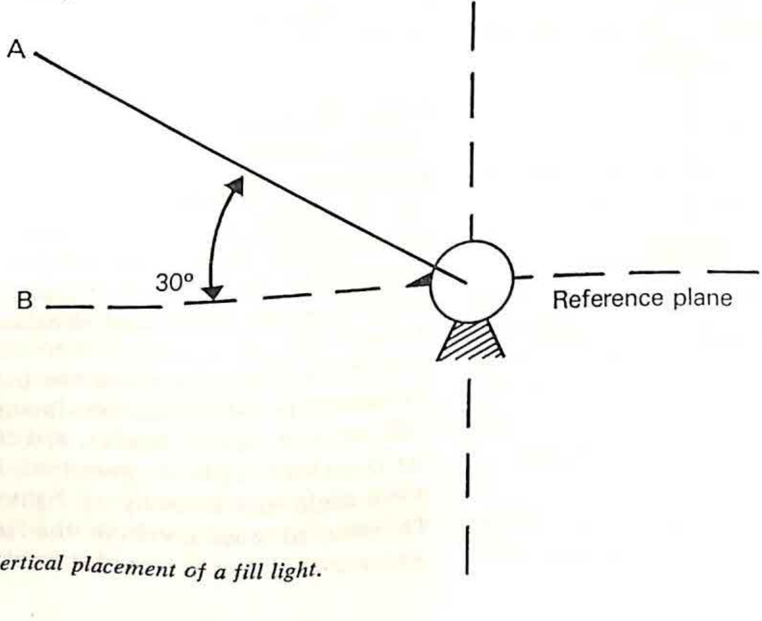


FIG. 28. *Vertical placement of a fill light.*

serves the function of a fill, which is to light out unlit areas and soften the shadows cast by the key light. A common mistake in television lighting is insufficient fill placed at the incorrect vertical angle. Thus we see sunken eyes and dark chin and nose shadows.

The fill light (horizontal placement for multiple camera position)

The general practice is to place a second fill light, fill no. 2, to compensate for a change of camera position. The basic principle still holds, that the fill light is placed at the camera position, and the light level combined of fill no. 1 and fill no. 2 remains as before. It should be noted that the new camera position views the subject from position A to position B, but the subject remains in a static position on axis A (Fig. 29).

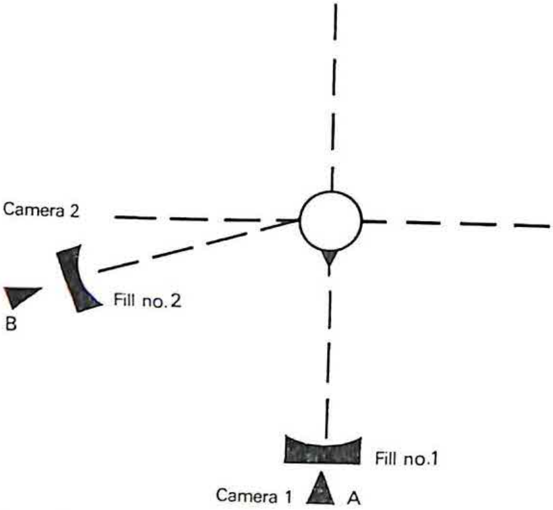


FIG. 29. *Horizontal placement for multiple fill lights.*

The placement of the set light

On a few occasions the background for a production consists of black curtains, but a producer generally sees this presentation as being too stark. The background therefore has to be lit as well as the subject. As indicated in Figure 30, even lighting is distributed on to the background, and its placement must avoid light falling on to the subject. This means that subject and background are lit independently of each other, which gives maximum control of the lighting sources for light balance of the final picture.

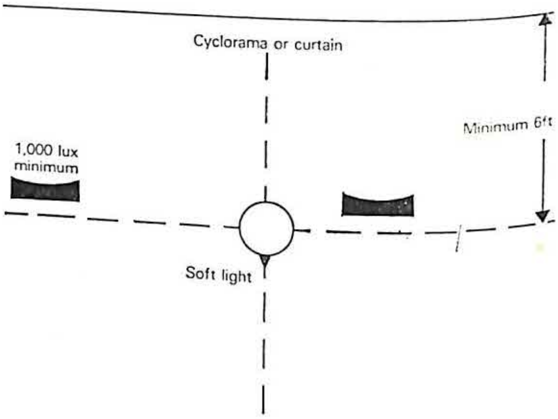


FIG. 30. *Horizontal placement of set lights for cyclorama or curtain.*

Figure 31 shows two hard-light sources with a controlled beam angle lighting the background set. These lights cast shadows and add dimension to the background. If the intensity of the light source is varied the contrast of the background is changed; this can change the mood and situation of the picture.

So far we have discussed the basic principles of the placement of luminaires to achieve good picture quality, and the working latitudes have been given both in placement angle and intensity of light level. If we were to now combine the individual placement of luminaires we would evolve

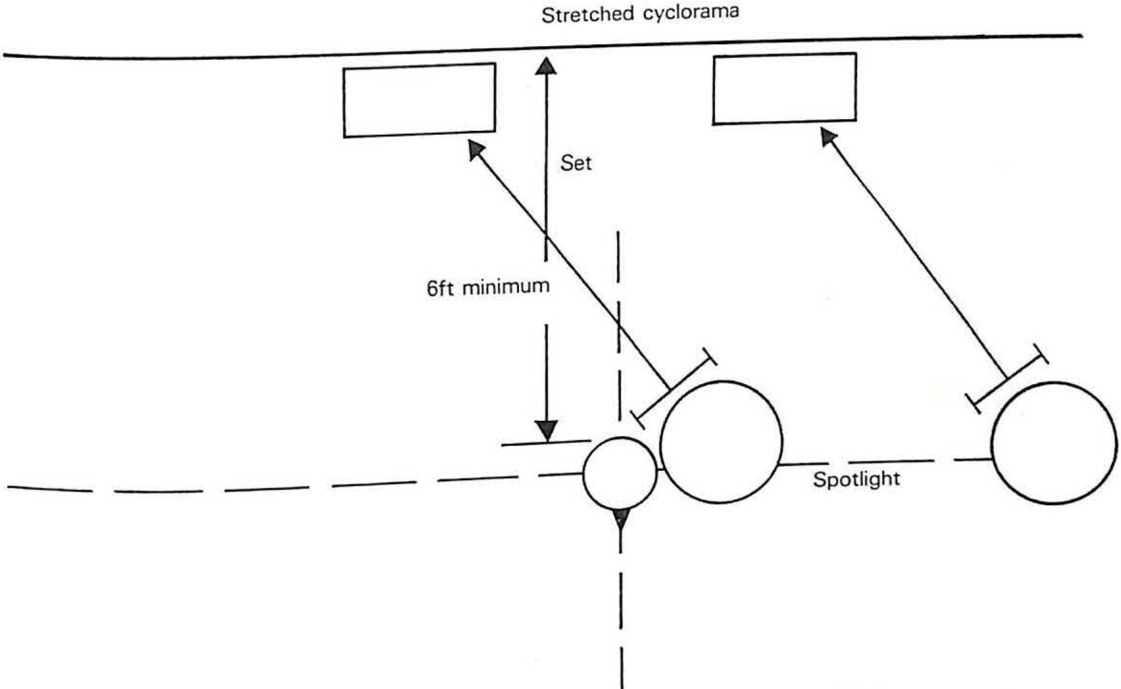


FIG. 31. *Horizontal placement of set lights (hard beam).*

two methods which form the basic pattern of lighting. The first method (Figs. 32 and 33), is known as *three-point lighting*.

The angles indicated in the horizontal and vertical plane are the optimum angles used to achieve a standard television portrait. (A portrait in television is one which gives a pleasant picture with minimum distortions and adequate shadows for added dimension to the subject. This is of course quite different than a photographic portrait.)

The second method is known as *four-point* lighting (with an original fill light). It is shown in Figure 34.

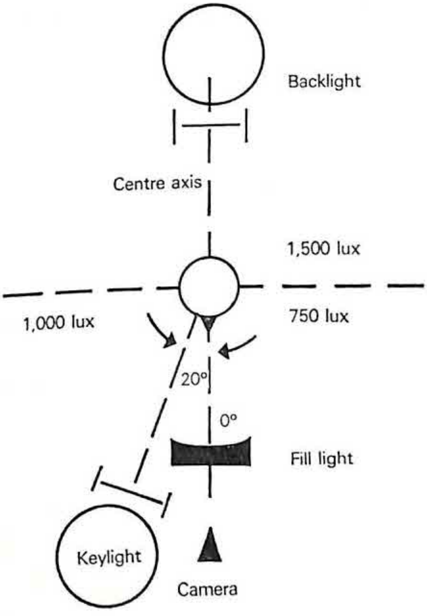


FIG. 32. *Horizontal placement of the three-point lighting method.*

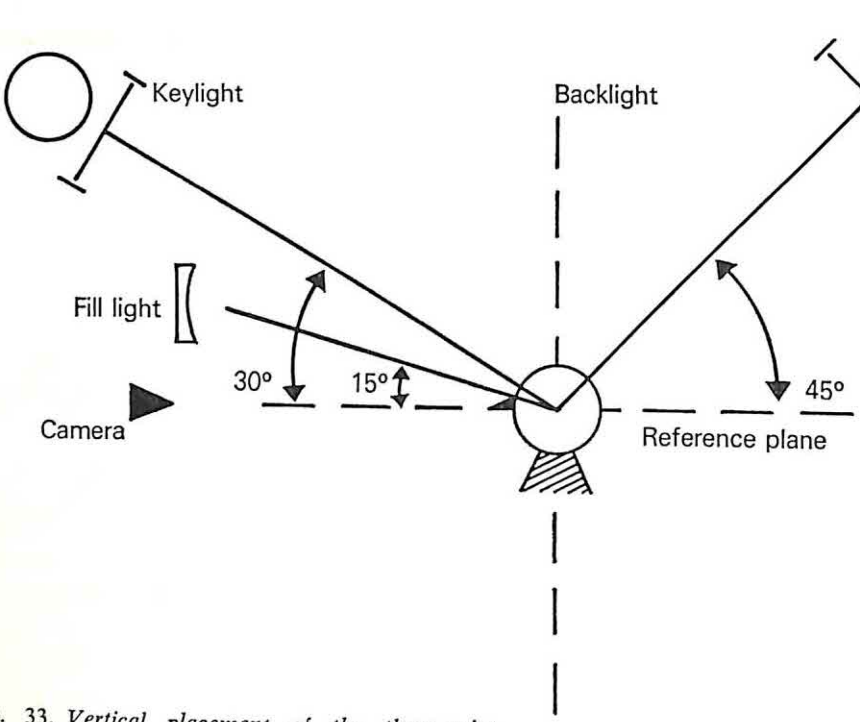


FIG. 33. *Vertical placement of the three-point lighting method.*

Balance of light

Having achieved correct placement and light level 50 per cent of the lighting director's work has been completed. The rest is achieved in the studio.

In the studio, 25 per cent of the effort is used in positioning the luminaires (which is referred to as *light setting*). The remaining 25 per cent is in balancing the intensities of light to achieve the final picture. However, while the above represents the percentage of effort involved, it does not reflect the percentage of importance. The most important operation is the balance of the luminaires, since in the balancing it is possible to eliminate or correct mistakes made in the earlier function.

Balance of light is the adjustment of intensity to achieve a pleasant picture using the key light as the reference intensity. It is therefore necessary to have control of the intensity of the fill light, set light and back light. The key light is made variable only when there are sufficient control units available, and to change the intensity a light-dimmer unit is used.

Where there are insufficient dimmers available, the lights to be placed on dimmers are in the following order : 1. Set light; 2. Fill light; 3. Back light; 4. Key light.

How then do we balance lighting? The following method ensures an acceptable result.

1. Place the key light and position on the subject. The intensity of the key light

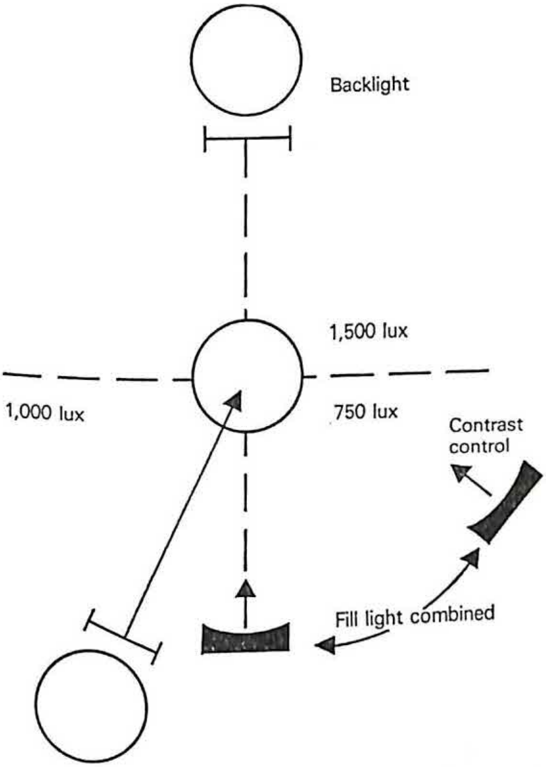


FIG. 34. *Horizontal placement of the four-point lighting method.*

is set to the required level (for monochrome television it is usually 1,000 lux, measured in the studios with an incident lightmeter).
2. The camera views the subject and the exposure of the picture is set.
3. The fill-light intensity is adjusted to fill unlit areas (viewed from the position of the camera) and to soften the shadows. The picture is viewed on the television screen and the light intensity adjusted for a pleasing picture. If too much fill light is used the exposure will change and the picture will bleach out, making the subject uninteresting.
4. The intensity of the set light is adjusted to achieve a pleasant over-all picture balanced between face and background.
5. The back-light intensity is then increased until there is a noticeable separation between subject and background.

Demonstrations and graphics

Some guidance should also be given on the lighting of demonstrations and graphics, which are very important in educational television, and on the lighting for mirror shots and projection devices.

The demonstration

There are two types of demonstration. One we can call the *static demonstration* (this is an arrangement of objects, and there is no movement); the *moving demonstration,* on the other hand, uses more than one area, with the camera following between areas. In both cases, pictures of the objects to be taken must meet certain requirements. These are as follows:
1. The object must be seen clearly (that is, the depth of field should be sufficient to allow the full object to be in focus).
2. The adjacent contrast within the object must be low but the shape and form of the object must be maintained.
3. The background must be suitable to display the object without some sections having the same grey-scale as the background.
4. The shadow of the object should not be distracting.
5. The demonstrator's shadow should not fall across the object.
6. The camera should be able to take shots of the object from more than one position.

These requirements make the demonstration a very difficult exercise, and the problem can only be solved by an extension of soft light. This approach has a number of disadvantages to the lighting director, since soft light is difficult to control and can cause flare in the camera lenses if it is not placed or set correctly, and moreover the light comes down vertically and is unflattering to the demonstrator.

However, it is often objected that the ETV producer is limited in flexibility by lighting as there is little latitude from planned shots, and the science programme is one which suffers particularly from this lack of flexibility. In consequence, some basic principles must be broken, and compromises made. The demonstration is ringed in soft light as shown in Figure 35.

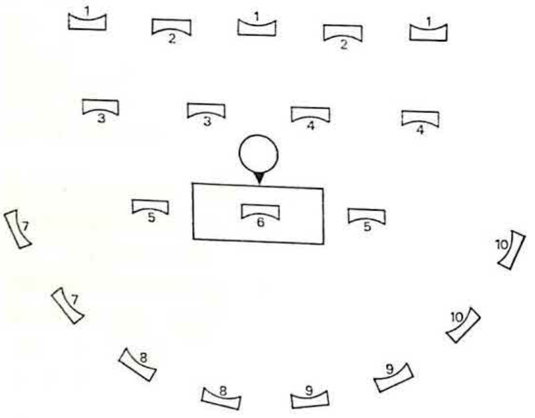


FIG. 35. *Softlight for demonstration lighting.*

This method can be very successful if the lighting director can obtain control of the light sources and achieve a correct balance. But it must be emphasized that, although the method looks simple, in practice it is very difficult, since a completely flat picture, through 180 degrees of shooting, is the hardest type of lighting to obtain. It is therefore necessary to have at least 30 min of production rehearsal time to obtain a good balance. Nevertheless the advantages of the method are as follows, if properly contrived:

1. It is possible to shoot 180 degrees and obtain good quality pictures.
2. Depth of field is easy to obtain.
3. It removes the unwanted shadows of the presenter and objects.
4. It produces low-contrast pictures for the presenter and the demonstration objects.

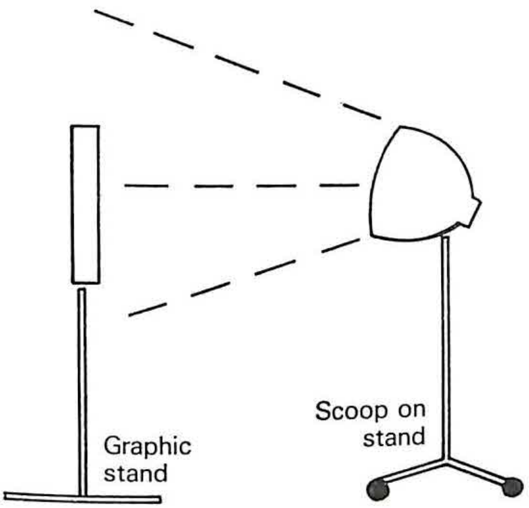
Glass objects for demonstration

The placement of the lights in this case is directly related to reflections seen from the camera position, so to avoid these, the camera positions must be known. The lighting director needs to decide whether to have no reflections and pictures of the presenter of reasonable standard, or excellent standard pictures of the presenter but some unwanted reflections. The method for removing reflections is to avoid lights directly over the camera, and this is the same for all types of reflective objects.

Graphics

Graphics are usually poorly lit, yet they are the most simple of all objects to handle; requiring soft, even light distribution. The graphic is mounted on a stand, and the camera shoots along the centre axis, parallel to this stand.

The graphic card should not exceed 60 per cent reflectance (television white) as this will change the grey-scale tones that have been designed by the artist. When graphics have a variety of colours, these should be carefully selected (in monochrome work-



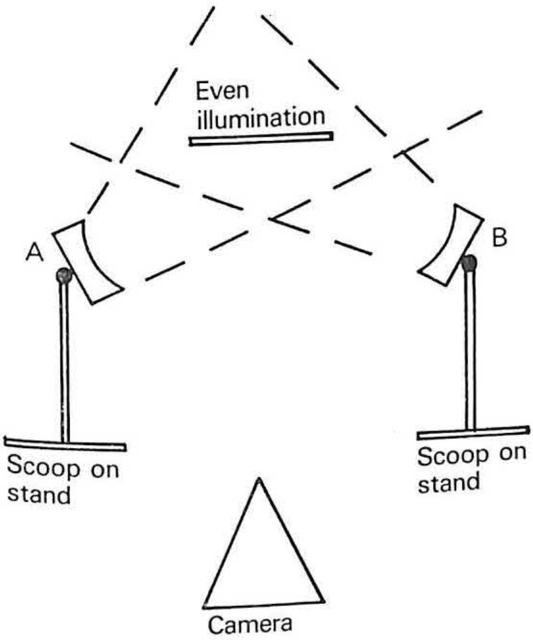


FIG. 36. *Softlight placement for graphics.*

ing) to avoid colours with the same tonal range on the grey-scale. It is possible to have extreme colour contrast but no tonal range.

It is sometimes difficult to achieve even distribution of light over the graphic due to the camera's position relative to the subject. Some methods of lighting graphics are described below.

The following design (Fig. 36) shows two soft lights (scoops) on stands; the general wattages of the globes available is 1,000 watts. This system is most satisfactory, but because the scoops are 1,000 watts, the lamps have to be on a dimming circuit. It also has the disadvantage that when the stand lights are moved, the even distribution of light is affected.

The graphic can also be lit from a hard-light source (i.e. a soft-edge spotlight, which is suspended from the grid-as in Figure 37).

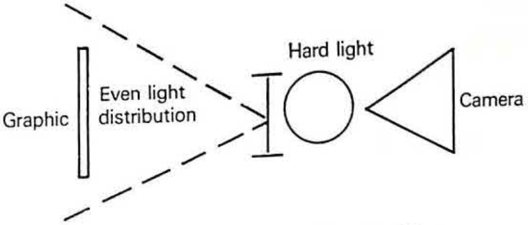


FIG. 37. *Hard-light placement for graphics.*

This method is commonly used in the studio, since the light distribution is even and the luminaire is not in the way on the studio floor. It is also less restricting to the producer, as the camera can move closer to the graphic without blocking off the light source and creating a shadow. However, with this method there is more chance of obtaining unwanted sheen on the caption, which reduces resolution as well as destroying the grey scale (Fig. 38). This can be avoided by tilting the graphic as shown below, but it is inconvenient, as the card has to be tilted by an operator, which means

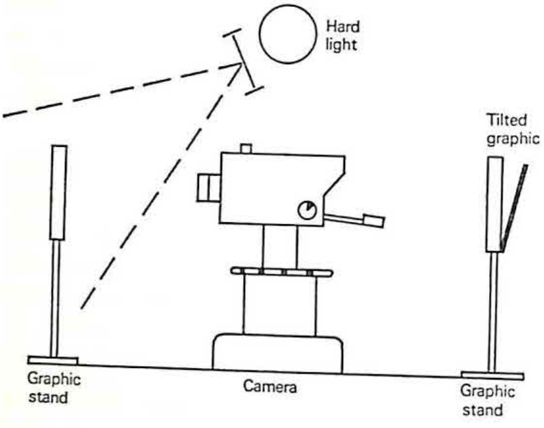


FIG. 38. *Reducing sheen on graphics.*

that he must have a monitor to gauge the amount of tilt necessary. Equally, if there are raised surfaces on the graphic, the hard-light method is not satisfactory, since unwanted shadows are cast. This type of graphic, which is very common in ETV production, must be lit with a soft-light source, and a very effective unit can be assembled for this purpose.

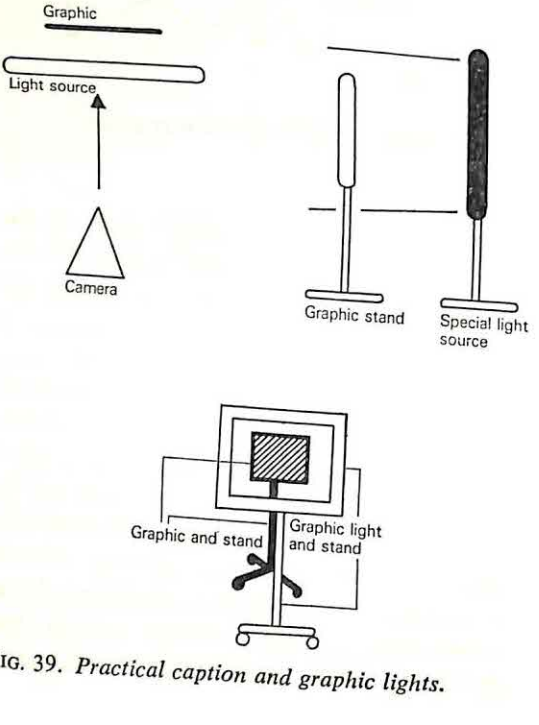


FIG. 39. *Practical caption and graphic lights.*

Figure 39 shows a practical caption light. The unit can be placed 1 ft 6 in away from the graphic stand and the camera can shoot through the middle of the lighting unit; eight incandescent strip lights can be used on the small strip fluorescent tubes. It is useful to place a switch on each strip lamp, and the reflector surface for the strip lamps is painted as matt white to give maximum diffusion of the lamp source. The unit is cumbersome and difficult to store, but is a most effective means.

The use of mirrors

The mirror shot is used frequently in ETV production as it aids the view of a demonstration. There are some difficulties, but good results can be obtained if the shot has been planned correctly at the planning meeting.

The suspended mirror is used to obtain an overhead shot directly above the demonstration table, (shown in Fig. 40). The position of the mirror causes a lighting problem, as it makes it difficult to place a back light for the demonstrator, and the positioning is very critical, since the horizontal scans on the camera will have to be reversed. A zoom lens is normally used on the camera taking the mirror shot, allowing flexibility in adjusting the shot as well as taking close-ups of objects on the demonstration table. When planning for overhead mirror shots, sufficient studio time must be made available to allow for adjustments of the suspended mirror and adjustments of the lighting.

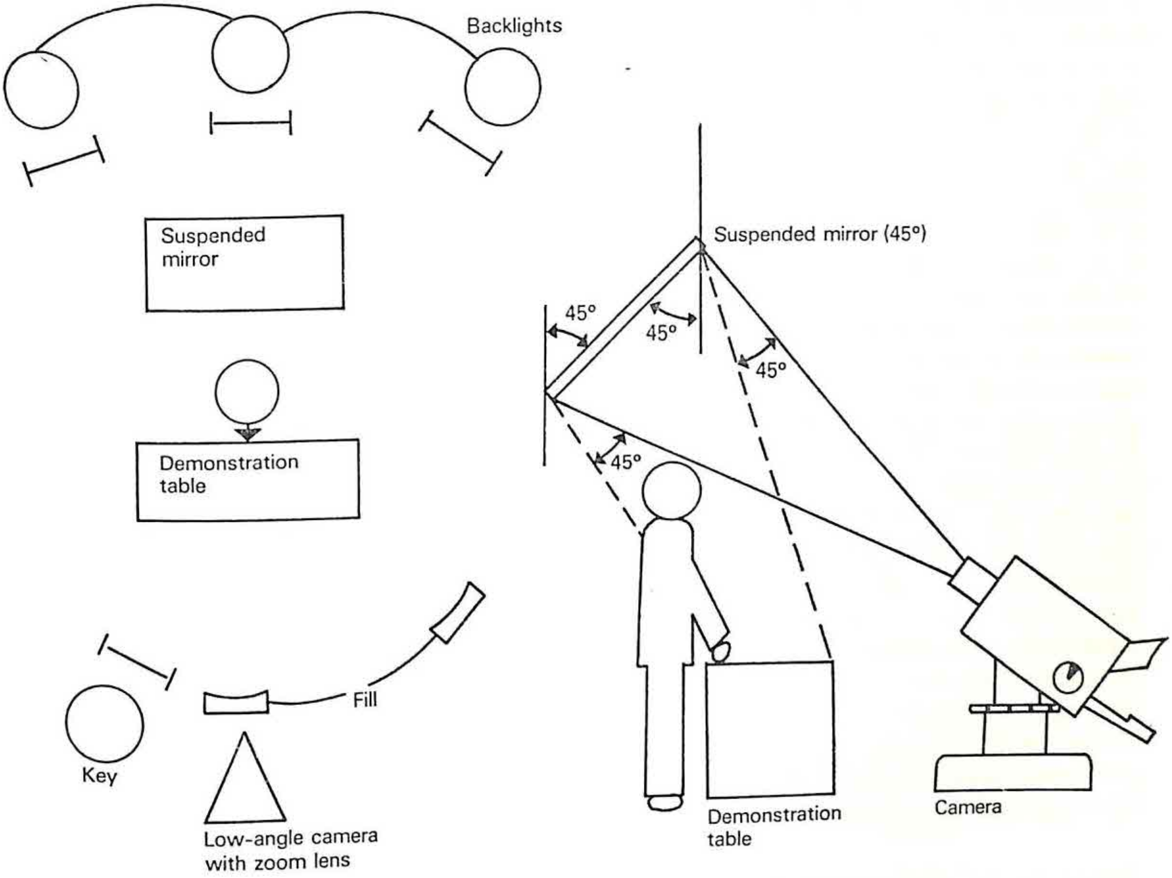


FIG. 40. *Position of mirror for mirror shot and lighting plot.*

Projection

There are two basic types of projection: front-projection and rear-projection.

Front-projection

The use of front-projection requires a light surface in the set upon which to project the image. As the maximum reflectance of white surfaces for television can be only 60 per cent, the projected image is only 60 per cent efficient. It can be seen therefore that front-projection has limitations and a practical picture of the projected image cannot be of large dimensions. Front-projection can only be used as a background, because when the presenter is placed close to the projected background it is difficult to light him and also avoid light falling on the projected area.

Rear-projection

Rear-projection is a more practical method, which requires a projector and screen. This system can be used effectively for ETV programmes, as the presenter can work close to the screen but the size of the image is restricted by the screen and the projector's power. Using a small screen (4 ft by 3 ft) it is practical to use a 35-mm projector and a screen with a transmission factor of 65-75 per cent. By using more than one machine it is also possible to overlap images for graphic presentations. Although this special effect has many applications, it is nevertheless as well to look at some of the practical problems. The projected image gives good results when the camera views the image along the centre axis of the projector. But if the camera moves in excess of 25 degrees from the centre axis it will receive only 50 per cent or less of the brightness of the image, which gives an over-all unsatisfactory picture (see Fig. 41). The larger the projection, the more unacceptable the picture becomes when the camera position exceeds the allowable bend angle. The over-all area of the picture is affected by the camera movement and the lighting balance varies as the position of the camera changes. Consequently, back-projection should be fully discussed at the technical planning meeting.

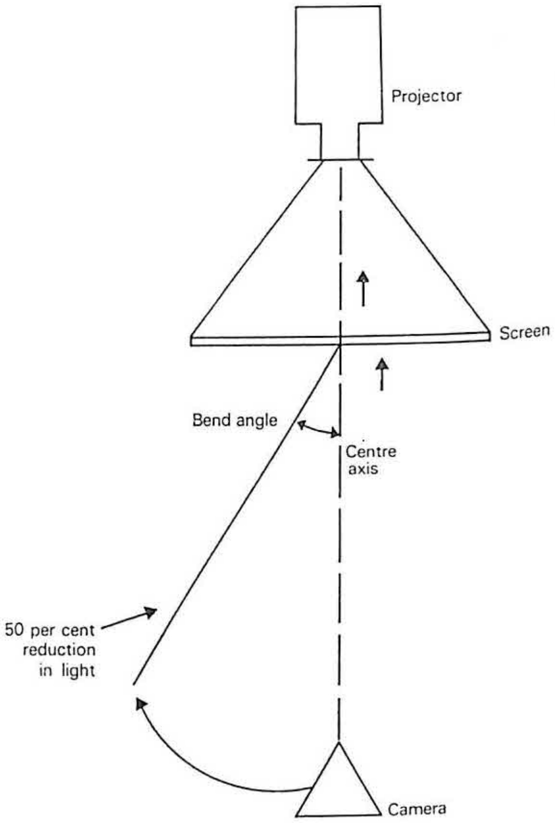


FIG. 41. *Rear-projection.*

Technical operations for colour television

Finally, a separate account should be given of colour-television operation. In recent years, colour-television production has increased dramatically, and while this has been mostly in the field of general programming, it is extending fast to the educational area. In some subjects, such as chemistry, medicine or geography, the advantages of a colour presentation are self-evident, and even where the benefit is less apparent, it is difficult, in an environment where the bulk of programming is colourized, to sustain enthusiasm for monochrome working.

Colour is, after all, natural. The environment we see around us is in colour and we take it for granted. However, when that colour is displayed on a screen, it takes on a different character, because we are comparing it with the colour already known to us in our subconscious mind. This is the first problem which the producer has to overcome.

A second, related problem is colour awareness—the ability to read colour, memorize it, and then translate it using electronic or film cameras. Colour is obvious, yet few of us could relate accurately a scene in colour from memory.

In producing for colour, therefore, we have to develop a greater discrimination: to think in colour as well as in pictures. There is also a much greater need than in monochrome for careful and co-ordinated pre-planning.

Yet having said this, we should not make the transition into too much of a mystique. The principles of direction are generally the same; what is needed additionally is a broad general knowledge of the colour process, and of its associated vocabulary and techniques.

The colour picture

Electronic colour pictures reproduce the coloured image (as described earlier in Chapter 5) by an additive process of the primary colours: red, blue, green. Variation in intensity of these primary colours is achieved by electronic means, and can produce almost any colour of the original scene being looked at. However, the resultant colour may differ slightly from the original—though this difference is predictable.

All production staff must learn to judge colour by what the monitor displays and not what the eye sees through a control-room window. It is pointless arguing with monitors—they will always win.

Planning

The economics of colour production have made total costing a must for all broadcasting organizations. It is not merely programme costs that have increased appreciably (by about 10 per cent excluding film stock) but especially the capital cost of colour equipment. Colour equipment costs up to four times more than monochrome. So in order to maintain economy, the time scale of production facilities (design, scenic construction, rehearsal and studio time) has tended to remain the same as for monochrome, except for line-up time, which may be much longer (up to 1 hr) for complicated programmes. Production staff have been forced to plan with much more care, working as a team and in much greater detail in order to keep pace. Whereas a fair degree of tolerance existed in the performance of video equipment handling monochrome signals, the operating characteristics and maintenance standards required of equipment for colour television are much more demanding. Fortunately, smaller and more sensitive camera tubes, and solid state technology, have produced more reliable, more compact and more versatile equipment, which has allowed the technical staff to keep pace with increased demands.

Lighting set-ups for colour television follow the same basic principles as for monochrome working, and the placement of key and light and back light for a portrait picture is much the same. In practice colour is in the scene itself, not added by coloured lights. It is standard practice that no colour is used when lighting the artist, and drama in general has few coloured lights, except for exterior sky or interior night scenes. Coloured lighting is normally reserved for entertainment programmes or for special effects, where realism is not required. However, far more attention has to be plaid to the quality of the light source, and its reduced flexibility.

Lights of constant colour temperature are required (colour temperature refers to the colour content of the light source, for example incandescent lights are inclined to be yellow dominant, while daylight fluorescent lights have more blue components).

The accepted norm of colour temperature is 3,200° Kelvin; if a lower level is fixed, the colour becomes redder and the image progressively more orange. So the practice of dimming lights is much affected, except for special effects.

Incorrect lighting produces noticeable colour errors on the monitor screen, particularly in flesh tones (to which the eye is peculiarly sensitive). Studio engineers therefore select the working colour temperature of the luminaires to correspond with the best results for their system (studio cameras can be set to any selected colour temperature), but once this is done the lights have to be controlled and kept within tight tolerances. For most purposes, a tungsten filament is used in the lamp, in an envelope of hardened glass quartz, with a halogen gas inside the envelope; this lamp has a full spectrum characteristic.

The colour team consists of: the producer/director; scenic designer; costume designer; lighting director; make-up man.

They should meet together at all times. Decisions taken by the team should be held to—but if changes do occur, then all must be informed. The problems of one member affect the planning of another. The paint for scenery will affect the colour of the costume and both will be affected by the lighting given. In monochrome any mismatching could be smoothed out—it was only a question of contrast control in black and white—but in colour a mismatching of colours is almost impossible to overcome.

Lighting for colour television

The most immediate change for the producer is in the field of lighting. Much of his knowledge of lighting for black and white has to be redefined, as the nature of the light in colour is quite different. The maximum contrast range that is possible in colour is only 20 : 1, and shadows, which are a traditional part of monochrome lighting, now appear as uninteresting voids; the lighting director must break and fill the shadows with different shades of colour.

Furthermore, spill from one colour to another must be avoided, as skin tones can be affected by superfluous coloured light from other areas of the set. One common mistake made by designers and producers alike, that of rushing into early colour production with bright multi-coloured sets and excessive special effects, can complicate these lighting restrictions even further.

Recently, new luminaires have been designed, consisting of a dual filament lamp, giving a range of 1.25 + 1.25 kW or 2.5 + 2.5 kW. A switch on the lamp allows either one or two filaments to be used (with the colour temperature remaining constant in either case, thus giving the lighting director increased flexibility in light placement). The table below compares the power of luminaires used in colour as compared with monochrome television.

Monochrome spotlights	*Colour spotlights*
500 W	1 kW
750 W	2.5 kW or 1.25+1.25 kW
2 kW	5 kW or 2.5+2.5 kW
5 kW	10 kW

Special effects

The expansion of colour television has also led to a greater sophistication in television special-effects equipment.

One of the major new areas of development is that of graphics. It is possible synthetically to colour any visual source, and in varying amounts of colours; with a black, grey and white graphic and with a *colour synthesizer* (one of the best known being the Cox Box), the gradations of monochrome may be separated into any three colours selected by the producer.

The *chroma-key* device (which inserts or "keys" one picture source into another) is an effect that should be cautiously used though it has a useful applicability to programmes such as news and talk shows, where it can supplement limited facilities to provide variety in scenic design.

To chroma-key one source into another, the producer must first choose the colour with which to key. To illustrate the point we can take a newsreader sitting in front of a plain cyclorama. The most common practice is to key on the colour blue. First one would make sure that the primary vision source (the newsreader picture) contained no blue apart from the background through which we are keying. This is not simply a matter of ensuring that the newsreader is not wearing any blue clothing; with some bright blue-eyed newsreaders, systems have actually been changed to key on another colour, or even different coloured contact lenses have been used, as where this is not done, the second vision source can be seen through his eyes.

Essentially, the keying process is that the second source, be it graphic, photographic, or moving material, takes the place of all the sections of the first source that are of the chosen colour. In this way the second source appears as background to, or part of the picture of, the first.

It should be stressed that what sounds like a straightforward process is often very complicated. The producer cannot zoom, pan, tilt, or in any way move the camera on the first picture without being aware that the second source will not vary accordingly, and this usually produces an optically incorrect image. It may be necessary to restrict shots or to be prepared to change the second vision source accordingly. Also, getting the keying perfect in terms of clean edges is often time-consuming, and in particular any variation from the fairly standard blue should be planned for carefully. If the primary vision source has to have, for example, talent dressed in blue, causing keying to be on another colour, then additional time must be allowed.

Conclusion

Colour is finally only one more dimension of production, and as it becomes universal, it will become a normal part of the producer's repertoire. At present, most of all it demands team work—and a methodical and organized approach from the producer himself, especially in the first months of his initiation.

Chapter 7

Filming

Alan Guley
John Halas

Filming for television fulfills a very wide variety of functions, from the relatively brief filmed insert to the complete film documentary. What we are primarily concerned with here, however, is the film sequence which is shot as an insert for television. In other words, it is an episode which, for some reason or other, has been photographed using a film camera, edited, and is ultimately projected through a telecine machine, inserted into the television recording at the appropriate time, and included as an element in the final programme, whatever its ultimate form of recording.

Uses of film

The main uses of film in television (apart from complete film programmes) are therefore as follows:

1. To provide documentary material, shot on location. In such areas as social science, actuality or case study material is important; equally in current affairs programmes, records of actual events are necessary.
2. To record interviews with people who cannot attend the studio, or demonstrations and other events which are tied to a fixed place and time-table.
3. To reproduce historical or archive material which usually exists on film.
4. To record demonstrations which require detailed cutting, close-up work, etc. (So a science demonstration may need to be pre-filmed, in order to control the presentation of information more exactly than would be possible in the studio (for example, the experiment may not work the first time, or may take too long to show without editing).)
5. To allow for special effects (e.g. time lapse and slow-motion work, to speed up or slow down processes).
6. To provide for detailed animation techniques
7. To record events, demonstrations, etc., which are too large, complex or unwieldy to reconstruct in the studio.
8. To record in advance certain scenes (e.g. in a drama production) which either cannot fit into the studio, or would be expensive to construct, given their limited role in the over-all action.

In essence, the filming process is a microcosm of the complete production process, and goes through many of the same stages. The main difference is that elements are photographed, edited, and dubbed at leisure, instead of simultaneously (as in the electronic studio). This gives at once greater control than tlevision, but also occupies a longer time span. This is why we talk about pre-filming; filming has to be carried out far enough in advance of the studio recording for all of its component processes to be accommodated.

The main processes involved in filming may therefore be summarized as follows:

1. A treatment is prepared.
2. Research is carried out, locations sought, actors engaged, bookings effected.
3. A shooting script is written, and a production schedule prepared.
4. Filming takes place.
5. Processing is carried out, and rushes returned.
6. A "rough cut" is made, and gradually reduced to a "fine cut" (a finished version).
7. Dubbing takes place.
8. Negative cutting and printing is completed.

It can be seen at once that some of these processes (at the planning stage) are analogous to, and actually a part of, the over-all production process.

We can therefore pick-up the sequence with the *shooting script*, which is the first main point of difference.

The shooting script

The shooting script is a detailed presentation of what is to be filmed, including both dialogue and filming instructions. It is therefore the equivalent, in film terms, of the camera script in television, with the proviso that the shots listed will be taken individually, by a single film camera, and not necessarily photographed in sequence.

Each shot is therefore referred to as a scene ana is numbered as in the following example:

Scene 1. *Long shot*—town hall; tilt down to long shot street, with Johnnie mixing with passers-by.

Scene 2. *Medium long shot*—street. Johnnie comes into shot.

Scene 3. *Close-up*—Johnnie's feet.

Scene 4. *Tracking shot*—with Johnnie.

Scene 5. *Medium long shot*—shop window. Johnnie stops by the display.

Scene 6. *Close-up*—Johnnie (through the window).

Scene 7. *Close-up*—window display. Johnnie's face is reflected in the window, and the street behind him. There is also the reflection of a policeman standing opposite, obviously keeping an eye on Johnnie's movements.

Scene 8. *Long shot*—through shop window, with Johnnie in the foreground. He turns round and looks across at the policeman on the other side of the street.

Scene 9. *Medium shot*—policeman. *Sound*—synch. "What's up? . . . Move along there."

Scene 10. *Long shot*—from the other side of the street, with the policeman in the foreground. Johnnie moves away from the shop window, walks quickly down the street. The policeman turns to follow him—then shrugs his shoulders and changes his mind.

For much of television work, especially for documentary shooting, it is not possible to prepare as elaborate a shooting script as the example above, because what is being filmed is actuality material, and there is no automatic control over either dialogue or action. But a basic indication of each set-up, and the associated action, should be prepared in advance, so that members of the production and technical team have some knowledge of what is envisaged. In television, the rule is always to be as explicit as conditions will allow.

The shooting schedule

The shooting schedule is derived from the shooting script; essentially, it is a schedule of the order in which shots will be taken, taking account of the best use of time, resources and personnel—consequently, all shots in a particular location should be photographed together, and all sequences involving the same actors should be recorded at the same time. This order will inevitably be very different from that of the shooting script (which is a visualization of the ultimate, cut product). The first requirement is to separate out interior from exterior sequences, since the former will normally require lighting, and it is wasteful to have a lighting crew waiting except for the periods when they are required. For exterior sequences, in particular, it is advisable to have alternative indoor scenes ready, in case the weather is unsuitable: in filming, time means money.

The shooting schedule should always try to take realistic account of how much can be expected in a single day. There is little point in planning a filming schedule which simply cannot be met. Much depends upon experience, but in the early stages of a producer's career, in particular, more time must be allowed. Equally, lit locations, and synchronized sound, take up more time than is generally realized, most of which is devoted to setting up the location and rehearsing the action.

It is obviously difficult to state how long a sequence should take to be filmed, since everything depends on the complexity of the shots. Many production crews work on the measurement of edited footage shot per day, that is, they may shoot 1,000 ft of film, knowing that it will edit down to five or ten minutes of script. This type of scheduling is not as strict in ETV productions, because of smaller crews and less equipment/staff movement, and it certainly cannot be assumed of documentary work.

With small production crews, there is also the travelling time factor, and many producer/directors seem to forget that it takes some time for a crew and equipment to reach a location set-up and then pack again and move to the next location.

On very large crews these problems are handled by the unit manager, but in documentary filming one very seldom has this luxury. In educational television, crew sizes range from one to six. These are apportioned as follows:

One-man crew: cameraman only (often a "stringer" or free-lance) for mute (silent) work only.

Two-man crew: cameraman plus sound recordist.

Three-man crew: cameraman plus assistant cameraman, plus sound recordist.

Four-men crew: cameraman plus assistant cameraman, sound recordist plus assistant recordist.

Five/six-man crew: as for four-man crew, plus lighting assistants/electricians.

Size is naturally related to the technical complexity of the production.

The filming process

Filming on location

If the cameraman has not been involved in the planning of the shooting schedule, it is most important to take time to discuss the script with him prior to the start of filming. Each "key" man on the crew should have a copy of the shooting script, which will save valuable time in explaining difficulties that may arise while on location. Script changes, or alternative shooting sequences, should be marked on the cameraman's script and each crew member can then change his script from the cameraman's copy. Equally, even though the cameraman and the director/producer know the language of shot size (as described in Chapter 6), there will always be a disagreement on the exact position of the frame area. If there is time, ask the cameraman to show the composition of the shot, before the filming takes place. However, if this is not practical (as with hand-held camera shots), at the very start of the shooting one can ask the cameraman to frame the shots as he interprets them, and check the result through the view-finder. Any good cameraman, once he knows a director's personal choice of frame size, will be able to adjust accordingly.

The actual process of shooting is sequential; the camera is set up for each scene, sound equipment put in position and tested, and lights arranged. The particular scene is photographed, and following this other scenes in the same sequences, after which a new set-up or location is chosen.

The principles behind this operation are, in many ways, similar to those for studio television.

Lighting and sound recording employ the same techniques, but as with camera work, greater flexibility, speed, and an ability to compromise are needed. The lighting cameraman, except for carefully pre-planned sequences, will have to light for the main aspects of his subject, and cater for the rest of the scene, and for unscheduled movement, by providing a general illumination (and relying upon fast film stock, which does not need such a high degree of light intensity). This is the case, invariably, with documentary work; in more structured shooting, such as occurs for scientific demonstrations, each shot can be separately lit (and indeed must be, as an extremely clear image, without flare or distraction, is required).

The same point can be made of sound recording. In planned sequences, the position of the microphone can be carefully judged in advance, and kept just outside the limits of the frame, with all dialogue rehearsed. In documentary work, the sound recordist has to follow the lead of the cameraman, and concentrate on audibility rather than quality. In this he is helped somewhat by the fact that audiences are now used, in documentary styles, to less adequate sound quality, but the ETV producer should be specially insistent on audibility. In much documentary work, catching the actual words of dialogue is not vital, as long as a mood is captured: this is rarely true of educational television.

The equipment used for film lighting and sound is obviously much more portable than its studio equivalent. Film lights are on stands, which can be set up quickly, or they are clipped to items of furniture. On location a generator is often required for larger lighting rigs, but the most useful development of recent years has been the pack of portable lighting equipment, which can be boosted from a mains supply for limited periods of time. Battery lights are also often used, as supplements, and reflectors are used to focus sunlight. Balancing interior and exterior light for film is always a problem, and time must be allowed for this exercise; it will sometimes mean using gelatines to reduce intruding natural light (e.g. from a window). Lighting for colour filming is inevitably more complex than for monochrome, as colour temperature has to be controlled, and again adequate time must be allowed for setting up the lights. The cameraman should also be able to reconnoitre locations in advance (especially for colour filming).

The position of the sound recordist is in some ways the most difficult of all, as he has to try to obtain good audio quality, while dictated to by picture considerations. Unlike his studio counterpart, he will not have access to a large number of microphones; characteristically, he will be using a two-way mixing unit, or at best a three-way mixer (unless other equipment has been specially ordered). He is likely therefore to rely to a considerable extent on personal (neck) microphones, and on sensitive mikes with a good pick-up range. He may also make use of audio-controlled units, and gun mikes (which can be aimed, like a gun, at a sound source, and operate at a distance, filtering out extraneous background noise). But the operation of these microphones, while often very useful, cannot be guaranteed to produce good audio quality, and in the case of the radio microphone (which has a small transmitter, working to a separate receiver and hence obviating the need for a trailing cable) operation is variable, affected by physical terrain and other kinds of interference. The sound recordist must therefore be given the chance to experiment with different forms of pick-up on the ground, before shooting actually begins.

In the studio, extraneous sound can be filtered out, but on location, background noise can easily intrude, either drowning the principal dialogue, or (more seriously, because it may be more difficult to perceive) making subsequent cutting difficult. For example, if during one shot a lorry passes, and a close-up of the same scene is shot later (without the lorry), it will be difficult to mix the two shots in the cutting room. The producer's ear, as well as the sound man's, should be attuned to background noise and conditions.

Camera mountings will, because of portability, be less varied than in the studio. The most standard item is a tripod, with a pan and tilt head, which allows for basic camera movements, but tracking devices and dollies will be much more rarely encountered. In recent years, the miniaturization of equipment and an emphasis on 16-mm working has led to an improvement of techniques with the hand-held camera, and this affords a much-needed flexibility. It allows, not only for tracking shots, but also permits the cameraman to involve himself much more directly with live action, even to follow it when it is unexpected.

There are basically two different kinds of filming—and each has its own individual style. The first is traditional: the pre-planned variety which has a shooting script, a shooting schedule, and so on. It is this form of filming which, in educational television, is most likely to feature in drama inserts, or in elaborately arranged scientific demonstrations.

The second form is perhaps more frequent today: the more casual form of shooting which is characteristic of the documentary, and which is important for current-affairs and social-science productions. This is filming which is meant to be a record of actual events, and it makes greater demands upon the camera crew for spontaneity and improvisation. It is also, of course, very much the hallmark of general television. What it requires, more than anything, is an ability on the part of all concerned to compromise.

Some special consideration will be given to its techniques later in this chapter.

Continuity and slate numbering

Whatever the form of shooting, it is most important to have a record of what has been photographed, to aid both the editor and the producer in their later work of film assembly and montage. Consequently, the script assistant (or in smaller units the production assistant, or even at times the producer or cameraman himself) must keep notes of what has been taken. In their most elaborate form, these notes are written on individual sheets (known as *continuity sheets*) to accompany each shot; they are typed up later, and distributed to the production and editing staff. But even if there is insufficient time and manpower to prepare detailed continuity sheets, some specific record of what is on each reel of film is required (even the "stringer" cameraman files a "dope sheet" with his film, giving background information for the story-writer, and shot details).

The record is not only necessary for editing purposes; it helps retain continuity when scenes are shot out of sequence. It is important, for example, that there should be an available record of what actors are wearing, background action to shots and noise levels, weather and light conditions. If these are not observed, and similar conditions ensured for related shots, the scenes will never match or cut together in the editing channel.

Continuity is a demanding job, and in the feature film industry, it is undertaken by professionals. In educational television, it must necessarily be another function of the production team, and all members should be on guard for breaks in continuity. It is all too easy, not simply for an actor to change costume between shots which are separated by time, but also to change, albeit slightly, the actual sequence of his actions, his expression or eyeline. Actors eventually develop a sixth sense about such matters, when they are experienced in filming, but the final responsibility is the producer's.

A further important function relates to *shot numbering*. This is not a matter of ensuring continuity, but of filing and identifying shots so that they can be retrieved at will.

Shot numbers are recorded on to a *clapper board,* with which most readers will be familiar (Fig. 42). It is also this board

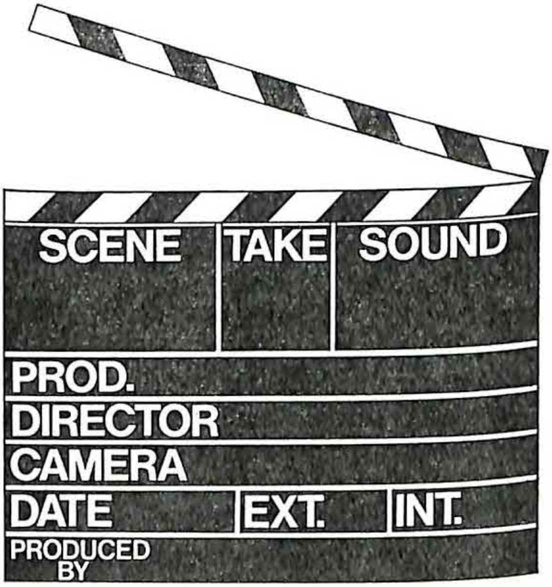


FIG. 42. *Clapper board.*

which gives an indication to the editor for synchronization purposes (he is required to match the sound of the board arm striking to the same visible action, so ensuring that the rest of the shot will be synchronized).

Methods of numbering are variable. For documentary filming, where no detailed shooting script is available, the procedure is to begin with scene 1, and to continue in sequence. Each attempt at completing the shot is known as a *take,* and the takes are similarly numbered (as a guide to the editor, and to the laboratory, of which version is finally preferable). If a large number of takes is attempted, not all of these are printed up (so the takes are listed as "O.K." or "N.G." (no good).

Where a shooting script is available, the technique is more complex. Since shots are taken out of sequence, two items of information are necessary—the scene number (according to the shooting script), and the slate number (the order in which scenes have been shot).

Each slate may also have a number of takes. It is therefore possible either to include on the clapper board a scene, slate and take number, or alternatively, to number scene and slate only, and regard each slate as an individual take. This is what is proposed in the example below, where the slate which is preferred has been ringed, as an instruction to the laboratory to print up this version only:

Scene 1. Slate 1, ② and 3
Scene 5. Slate 4, ⑤
Scene 4. Slate 6
Scene 3. Slate 7
Scene 2. Slate 8
Scene 6. Slate 9, 10, ⑪, etc.

Recording sound

There are four basic methods of recording sound in filming, referred to as: combined optical (COMOPT), combined magnetic (COMMAG), separate optical (SEPOPT), separate magnetic (SEPMAG).

The two forms which concern us here are SEPMAG, and COMMAG. (COMOPT is a sound system which is normally used for the projection of films in classrooms, or in cinemas; it is therefore mostly a distribution format. SEPOPT is encountered more rarely, and is mostly associated with recording processes in feature films.)

It is consequently the two forms of magnetic recording which are most important. COMMAG (known as "striped" film) has magnetic recording stripe(s) on the side of the film itself; the technique is known as *single-system recording,* and is mostly used for news-reel work. The disadvantage is that picture and sound must be cut together, which does not allow for separate editing of audio and visual sources. SEPMAG, or *double-system recording,* records the sound on to a separate track from the picture, and both can be individually edited. Although this is a more complex technique, it allows for a much more creative approach to film editing, and is therefore the standard method of recording in most senior broadcasting organizations, although still less well-known in the developing world.

Double-system recording infers that camera and audio recorder are separate; the means of recording is normally for the audio signal to be recorded on to quarter-inch tape, which is later transferred on to 16-mm track, for editing and synchronization purposes. A means therefore has to be found of synchronizing the camera and tape recorder, and three standard methods are available:

1. The camera and the recorder are operated from mains power, with the camera driven by synchronous motor. This system gives excellent synchronization between the picture and the sound recording, but has the disadvantage of power cables attached to the camera. Even if a portable power a.c. converter is used the camera crew lose mobility.
2. The second method is to use a camera equipped with a "pulse/synch" system. This is by far the best method for recording in the field.
3. Is an advancement on method 2, using a crystal oscillator in both the recorder and the camera to maintain correct speed-synchronization.

Planning for the unseen

Perhaps the most significant difference between film and general television is that the former cannot be seen until after it has been shot. Film has to be sent to the laboratories for processing; until the "rushes" have been viewed, therefore, it is impossible to tell whether an event has been faithfully captured. This is why film crews make a practice of dispatching exposed film to the laboratories each day for quick processing, to give them an assurance that they have been successful in their work, and that particular items do not need to be re-shot. There will always be times in any producer's life when something does go amiss with a piece of filming that simply cannot be repeated (especially in documentary work), and he will have to make the best of what material he has available. It is therefore as well for a producer to think, even as he shoots, of what additional items he might need to reinforce his work (and even to visualize how he might improvise, if he is forced to do so).

One important feature of filming "unseen" is that (again unlike the electronic studio, where the vision mixer cuts the programme as he goes along) film editing is an anterior event, so that the producer has to visualize the editing process in his mind, and make sure that what he shoots can actually be edited, clearly and convincingly, together. The most common complaint of editors is that junior directors shoot uneditable material, by which they mean (a) that the action of the various shots does not cut easily or naturally together, and (b) that not enough "cutaway" material has been shot.

There are many books on the "language" of film, which give ample instructions on camera placement, continuity and camera angles, and there is no need to repeat such basic advice here. They amount, in the main, to a few simple rules. The producer is invited to imagine a particular eyeline for each piece of action (which is the main camera angle, and to which his actors must be required to play). If they do not do so, the cutting will make their action look jagged and unnatural. In order to achieve this effect, the audience must not see any change in position or clothing of the action; the expression of the actor must also be exactly the same from the first cut to the next cut. The main conditions could be summarized as follows:

Match the position: relationship to the background and surrounding objects.

Match the movement: make sure that the hands, feet and position of the body are the same from shot to shot.

Match the look: if the actor is looking down in the first shot and immediately you cut to a close-up in which he is looking up, the shots will not match.

Equally, when the same action is shot again, to allow for a change in size or angle, it is important to begin the action well in advance, and to end it late, so that the editor has a choice of places at which to make his cut.

In most situations, the basic rule is to shoot a master shot, which includes all the action, and then to shoot repeats of particular sections (often at different angles) as well as cutaway shots, which allow the editor to break up the sequence if he so requires.[1] This is done not only to increase visual variety; it also permits dialogue to be shortened or changed (since it affords a visual cover, to be laid over the dialogue cut). The use of SEPMAG recording, with its individual picture and sound tracks, makes a good deal of sophisticated editing possible in this way.

It is often said that one cannot shoot too much in the way of cutaway material, especially in documentary work, where the shape of the final programme is often unknown until a late stage. At the same time, one cannot shoot interminably, otherwise film costs will become prohibitive, and a balance must be found. A good deal is also said about shooting ratios (by which is meant the volume of film shot, as compared to the final cut footage on the screen). In some cases, surprisingly low ratios have been achieved, and this is quite possible where scripts are pre-planned. As a rule of thumb, for pre-planned sequences, 4 : 1 is a maximum figure, which can (and should) be reduced by a good producer; for documentaries a figure as high as 10: 1 is often employed.

Documentary filming

Some special problems are encountered with documentary work, where it is most important to survey the actual scene in advance, and to work out where lights and cameras should be placed, and where the significant pieces of action can occur. A dry run, with technicians, is especially valuable, so that each will know what he is up against. In the case of more complex events, more than one camera may be necessary (with one recording the major part of the action, and the second used as a mobile camera, taking close-ups and cutaway shots). At times it may also be necessary, where a continuous record in synchronized sound is required, to have two sound cameras running throughout the action, with mains synchronization (so that their pictures can subsequently be cut against each other).

If an event is likely to last for some time, and it is impossible to determine in advance exactly where the main points will come, consideration should also be given to using extended magazines (of 1,000 ft), which give a longer running time. While these magazines are heavy, and prohibit hand-held camera work, at least they will ensure that the main action does not occur while the camera is being re-loaded Alternatively, if two cameras are available, it is possible to stagger their shooting so that one is always available while the other is reloading. Sports events are normally handled in this way.

It may also be necessary to invent a series of signals for the producer to give the cameraman, to monitor his shooting without speaking aloud and so interfering with either the action or the sound recording. These can be simple hand signals, such as are used by a floor manager in the studio, to indicate when to run the camera, when to cut, and the size of shot to be taken. Thus a single finger can indicate a one-shot, two fingers a two-shot, and so on. A circular movement of the hand gives a signal to run the camera; drawing the hand across the throat indicates a cut.

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[1] This is in addition to close-up shots which are part of the planned sequence, and which are an essential part of the shooting.

It may not always be possible, if action takes the crew by surprise, to put a clapper board on the front of the shot; in such cases, if there is no mechanical form of marking the shot (as with "blip" synch—a device which fogs a frame of film, and simultaneously registers a blip on the sound track) then the shot may be "end-boarded" (i.e. the slate is put on upside down at the end of the shot). This needs careful briefing: all too often, in the heat of the moment, the camera is cut before the slate is added. (The upside-down position is important as a guide to the film editor that the board is not in the usual place.)

Much depends in documentary filming, therefore, on allowing adequate time for planning and setting up a location. The room in which the activity is to take place should be reserved well in advance, and light and sound facilities installed early, so that by the time of the shooting, everything is ready. The producer or his assistant can give a general guide as to lighting positions, and sound levels, by acting out the role of the performers.

Much naturally depends upon gaining the confidence of amateur performers, and on remaining unobstrusive; otherwise interviewers may dry up, or action may be interrupted by them turning to look at the camera. This can only occur if the pre-planning has been thorough, so that everyone knows his job, and additional instructions or changes are unnecessary. In interviewing, in particular, the subject must be made to forget the presence of camera and microphone, and while a good interviewer can do a good deal to help, his work can soon be spoiled by a sudden noise, or an instruction to cut because the film has run out.

Processing

Two general kinds of film stock are employed: negative (from which a positive print is made), and reversal (which gives an original positive version). When filming with negative stock, the laboratory sends back to the producer a positive print called the *work print*. This is used by the editor to assemble and arrange the shots in the correct order, after which it is again returned to the laboratory for negative matching, when a *release print* is made from the original negative. Sometimes, with historical material, an additional negative is made, and the camera original is not cut, but this is not usual with ETV and small documentary films.

When shooting with reversal film, the camera original is returned from the laboratory, and the editor must take great care when cutting to avoid scratches and dirt marks damaging the film. (In some television organizations the camera (reversal) original is work printed and the edited print is matched with the reversal original.) The main reasons for choosing reversal film are speed (when immediate projection is required, as with sport events) and economy. For educational television, it is the latter reason which is important, but it can often be a false economy, and whenever possible negative stock should be used. This is particularly true when repeated uses of a film sequence are envisaged, and damage must be avoided at all costs.

Editing

The film editing of documentary and ETV production differ greatly from fully scripted feature films. Where the editor on a feature production has very little control over the "story-line", on documentary/ETV productions the editor and director can nearly always adapt the film on the cutting-room benches.

There are two approaches to the editing of films. The first is for the producer to give to the film editor a *cutting script,* showing the order in which he wants the film assembled. Thus he will list the sequence of shots and takes, the dialogue, and also add any notes on how he would like the sound tracks arranged. The editor then works by himself to arrange the film in sequence, as an *assembly*. After completion of the assembly, both view the film together. Comments and alterations are then discussed, and the editor continues to "trim" the programmes in order to produce first a *rough cut,* and then a *fine cut*. The final edit is again discussed before sound mixing, and any last changes made.

The second approach to editing is characteristic of many directors who believe in the creation of the film on the cutting-room bench. Both work continuously together, and the editor and producer/director relationship is closer, but a great deal of time is wasted in the cutting rooms. For educational television, where resources and personnel are limited, it is better to plan ahead as far as possible, prepare a cutting script, and let producers and editors play their separate roles.

Editing sequence

The main sequence of editing is therefore as follows:

1. Each roll of film is broken down into shots, after it has been logged.
2. Main sequences are grouped together.
3. Cutaway material is separated out and marked up for a particular sequence.
4. Sound tracks are marked up and placed with the appropriate picture (either in separate rolls, or in the same film can).
5. An assembly is made up according to the cutting script, and is viewed.
6. After modifications have been made, a rough cut is prepared, and the main synchronized sound tracks are "laid" (matched) to picture.
7. After further viewings, a fine cut is agreed, and final trims are made (trims being the fine cuttings of each sequence, as exact cuts are made).
8. Sound tracks, music, location sound and commentary are synchronized to the picture.

The final stages

Dubbing

Dubbing is the point at which the various sound sources are balanced and mixed together, into a final blend of commentary, dialogue, music and effects. As such, it is a technique employed mostly where separate sound and picture sources have been recorded, on SEPMAG.

In essence the process is simple. The original dialogue which was recorded (in synchronization) on to quarter-inch tape is transferred to 16-mm magnetic sound track (which matches the gauge of the picture). This is then laid, by the film editor, against the picture, in synchronization. Sound effects are also transferred on to magnetic track, as well as music, and these are again laid in by the editor, at the appropriate places. At times, commentary will also be pre-recorded in a sound studio, and laid in the same way.

We therefore have available, to match the cut picture, a number of different sound tracks, which need to be blended, or mixed, into a composite whole. This process is carried out in a dubbing theatre, where the picture is projected on to a cinema screen (or in more economical formats, on to a television screen, via a telecine device), and the sound sources are also run in synchronization, on separate sound heads. The dubbing mixer has in front of him a console which gives control of each sound source separately; he can alter volume, tone, and to some extent modify elements in the recording. In more complex installations he may also be able to play in taped effects, or gramophone discs (with the assistance of individual operators).

The dubbing mixer will be working to a dubbing cue sheet, which indicates the exact point at which different sound elements are laid to picture, so that he can introduce them at will. He is therefore in a position to alter the balance of one source to another, to bring up commentary and fade down dialogue, to fade music in and out, or hold it at a lower level under other effects.

He does not, however, normally mix all his sources at once. He begins by making a pre-mix of, say, music and effects; the resultant blend (known as an M and E) is then used to balance against commentary or dialogue. In this way the finished result is achieved gradually; the mixer is not expected to blend too many sources simultaneously, but can concentrate on particular problems at a time.

In many cases, the commentator will actually be in the dubbing theatre, working inside a sound-proofed cubicle, where he is able to see the picture, but will begin his speeches according to cue lights. This makes for a greater likelihood of human error, but avoids the blandness and detachment which often comes when commentaries are pre-recorded and the commentator cannot see the film. In complex productions (such as in feature films) actors also post-synch their dialogue, speaking lines which have already been roughly recorded, as they watch their own performance. This is a most exacting requirement which is generally out of reach of educational television installations and in any case, only short sequences can be handled at a time (this finished film is broken down into short segments for the recording).

The range of dubbing is therefore considerable. It ranges from the projection of silent film in the studio, via a telecine machine (with commentary spoken from the studio, or music played behind) to pre-recorded, multi-mixed inserts. For full control of the operation, however, and especially for documentary work, there is no substitute for the dubbing process.

The show print

The remaining processes are technical. From the finished work print, the picture negative is cut, then sent to the laboratories for processing and for the production of a release or show print. (In other words, the same sequences as appear in the work print are taken from the negative, assembled in the same order, so that an exact duplicate of the work print is available in negative form. If this is then printed up continuously and processed, a new and perfect copy, without joins, is available for telecine projection.)

The show print naturally has to be ready in advance of the studio recording, and it should be checked, to make sure that the synchronization is exact, and that the picture quality or grading is correct (i.e. that there are no marked variations of light intensity as between shots). During camera rehearsal, it is normal to use the work print for rehearsal, and to run the show print only once for the benefit of technicians; this eliminates the chance of damage or scratching before the recording.

Special effects in film

Some special effects can be obtained with the film camera, by varying the speed of operation. For normal purposes, the 16-mm film camera runs at twenty-four frames per second, but for television it is modified (for purposes of scanning) to twenty-five frames per second. If the number of frames per second is reduced (i.e. the movement of film through the camera is slowed down), an illusion of speeded-up motion will result, often used for comedy effects (e.g. to reproduce the style of old-time silent movies) or to increase a sense of speed (e.g. to accelerate a tracking shot from a car). Conversely, if the number of frames passing through the camera is increased, an illusion of slow-motion is obtained (e.g. for dream sequences).

For this technique, a variable speed motor must be fitted to the camera. The ultimate in this kind of special effect is in time-lapse photography, for which a single frame of film is exposed at stated intervals, to cover such slow moving phenomena as the growth of plant life. When the resulting film is processed, and projected at a normal speed, an effect is obtained of growth in a single, continuous movement. Apart from trick effects, this technique has obvious potential in scientific areas, to give an over-all sense of an action (conversely, slow motion photography is used to concentrate attention on actions which normally pass too quickly for the human eye to observe in detail, e.g. the movement of a runner or a horse). At its simplest, time-lapse photography can be practised by exposing a frame of film at precise intervals with the camera fixed on a tripod and the cameraman returning to his post when required. But this is time-consuming, and remote controls can be purchased or hired which not only switch the camera on and off at pre-set intervals, but also briefly illuminate a lamp, to provide illumination during night periods.

Filming in colour

The key to filming in colour is the fact that colour film is affected by light in a different way from black and white stock. Previously it was possible to shoot from early in the morning to late in the day. However, colour temperature now restricts the shooting time available to the producer on location.

Fill light is needed more than it was in black and white, and the point made about breaking up shadow, in notes on electronic television, is equally valid for film. Fill light must be blue tinted to raise the colour temperature, and make-up, wardrobe and set design must also be more subtle.

The producer planning a filming schedule must therefore take into account the characteristically shorter filming day, and extra time demanded by lighting set-ups. It is up to him to plan so that rehearsal time can be dovetailed efficiently with technical setting-up time.

In the particular case of reversal shooting, the producer is very much at the mercy of the amount of light available and the ability of his cameraman to gauge exposures correctly. With reversal shooting, whether black and white or colour, the exposure latitude is always narrow, and particular attention should be paid to the red tinted stocks made particularly for skin-tone acceptability in face-to-camera shooting.

In editing, the producer working with negative stock has an obvious advantage over the reversal producer, since colour matching and grading can help enormously. Even the red tints caused by late shooting can be graded out to some extent. A basic question for the producer using negative is whether his work print should be printed in mono or colour. This decision will be influenced by how critical he feels the colour balance to be. If the filming has been particularly difficult in colour terms (for example night shooting, special effects, or with extremely variable cloud cover) then it is uneconomic not to colour work print the entire shooting, or at least the O.K. takes. Otherwise possibly key rolls only can be printed up in colour.

In matters of cost, the producer has more of a responsibility to keep his shooting ratio low: obviously colour stock and processing, not to mention shooting time, are more expensive. The producer used to covering a set-up quickly with many angles will find he has to be more certain of what he will finally use in colour programmes.

Film matching in colour

When filming is for "insert" purposes, it is important that the shooting be conditioned by the requirements of the studio and not vice versa. This is essential, as the two media have inherently different characteristics.

Thus, both before and after shooting, the producer must be on the lookout for matching problems. The modern electronic camera has a much higher colour frequency response than the best film camera and film stock, and when immediate transitions are contemplated between film and studio, involving the same people, in the same place at the same time, it will help to plant a "buffer" shot between these sequences. This will tend to minimize any mismatching, because the viewer cannot relate them.

Many errors can creep into film reproduction of colour, and should be guarded against. They include errors of hue (due to unwanted absorption of light in some dye layers of the film), errors of saturation (due to unwanted transmission of light), grading errors in printing, or faults from a particular batch of film stock. Grain is also a problem with 16-mm colour. Some of these can be compensated for during rehearsal and recording by electronic means, and in sophisticated systems, final adjustments can be made by TARIF (a device for the rectification of inferior film, which can be automated, to feed corrections into a memory system).

Film animation

While live action photography reproduces movement as it occurs in life, animation recreates movement frame by frame, by advancing a position to a slight degree, and repeating this process until a complete sequence is covered. In this manner, drawings, diagrams, puppets or three-dimensional inanimate objects, which have no inherent capability of movement, can be brought to life through stop-motion or stop-frame processes.

In order to achieve the illusion of smooth movement, each position is exposed either twenty-four or twelve times per second. Twenty-four frames per second is called single-frame, twelve frames per second double-frame animation. It is possible to manipulate the animation quite freely, depending on the type of effect to be achieved; consequently animation is said to be the only branch of film making in which the creator can have complete control of moving images in both time and space.

The most popular animation technique is still cel animation, which lends itself particularly to those caricatures of human shapes and movements which make up the traditional cartoon film. In Eastern Europe, animated puppets are also very popular, and animated cut-outs are frequently used for television series, moved either frame by frame or in real time. Rostrum camera movement over still photographs is often applied to educational films and in particular to historical subjects. Various other techniques are used occasionally: object animation, silhouettes (cut-outs lit from behind), pixillation (usually live actors moving in a jerky "bewitched" fashion), images drawn direct on to film, etc.

In the last five years, two major new techniques have become important for the animation film maker: computer graphics and videographics. The application of computer technology to the graphic image has made many previously impossible or expensive effects available to the animator, and has led to the creation of new styles (like "computer animation"). Little or no original artwork is necessary, and there are computers which can synthesize movement in perspective, tone, colour, human movement and talking as well as geometric shapes and outlines. So far, the main applications of computer animation have been in mathematics and in films which have to be created very quickly (e.g. commercials). Today's computer systems compensate for the high cost of computer time only by their mathematical accuracy and by the speed with which they can bring an idea to the screen.

Videographics is a hybrid technique, which can be recorded either on videotape or on film. A television camera (or several) receives animated or still artwork or live pictures, and in addition a combination of inlays, superimpositions and other optical effects are available. Real objects can be stretched, squeezed and made to act like animated characters (far more easily than by photographic means). Colours can be selected arbitrarily, and so can relative sizes of characters and objects. However (as with computer animation, though less so) hardware costs have retarded the development of videographics.

The graphic image

The basis of the animated film is the graphic image. Rather than cutting from scene to scene, in animations the props, sets and actors can be drawn in and erased as required. Editing is done in advance in the animator's head; the function of a film editor in animation is mainly one of compilation. The art director's job, on the other hand, becomes crucial. The visual design of each frame must be significant, but not too tiring on the eye. In effect, this means that the composition of frames is nearly always simpler and more formal than in live action pictures: the animation designer is concerned with design in motion as well as in space, and so the animated figures must match well with each other and with various backgrounds at different times.

Animated films can use almost any variety of graphic style and presentation to express a particular idea or script. They emphasize qualities of visual aesthetics in addition to the dramatic and informational qualities of the live film.

Take, for instance, a drawing of a virus to represent disease. If it is transformed by animation into a graphic monster it can acquire a heightened significance. If well designed, a scene such as this can combine aesthetic, dramatic and instructional qualities.

In emphasizing the graphic qualities of animation the stress is on the use of outline drawings, layout, etc. Colour can sometimes seem to be an aesthetic luxury, but its significance is considerable in the right hands. In the illustration of abstract concepts, a rigorous colour coding can prevent ambiguities and make analysis of any sort appear straightforward and clear. In showing the operation of a tape recorder, for instance, mechanical moving parts can be shown in blue, electrical impulses in red. Colour can also be used symbolically to convey psychological implications, or to create atmosphere and feeling.

Basic principles

Frame by frame animation is created by two methods: substitution, and displacement. The animation is effected by exposing a frame, then either substituting one figure for another, similar but not the same, or displacing a figure to a position slightly removed. Substitution is characteristic of cel animation, where the animation work is essentially done at artwork stage, and displacement is characteristic of cut-out and puppet animation, where the artwork or puppet is physically moved under the camera. Both methods are however used in all forms of animation.

By substituting or displacing real people frame by frame, it is possible to simulate natural movement. The shapes of real people and animals can also be traced on to paper and they can be turned into animated figures. However, the charm and attraction of animation mainly comes from its capacity to distort reality, not to copy it, and the organized distortion of real movement for comic or emphatic effect is so much a part of animation that it is a basic principle of the medium.

Timing

Often the most difficult job in designing an animation sequence is deciding the timing for each movement. For obvious functions such as walking, opening a door, etc., the animation movement is likely to be twice as fast as in reality, unless it is slowed down for dramatic effect. To stress the difficulty of something like lifting a heavy weight, the animated character may remain stationary for an impossible length of time, or move unnaturally slowly. In character animation, movement can be timed in terms of real movement, and then speeded up or slowed down to the relevant extent. In diagram animation (including all non-representational movement), the timing must be done entirely by imagination. In all cases, the movement must not be too fast to be registered by the eye of the viewer, nor too slow to maintain his interest. On the whole, movement tends to work out to be best at a speed slightly greater than it is imagined, but it depends on the type of imagination. A difference of two frames can often have a noticeable over-all effect.

Speed of movement is one aspect of timing; smoothness of movement is the other. Single-frame animation, where the figure is substituted or displaced twenty-four times every second (twenty-five for television) creates an illusion of completely smooth movement. Double-frame animation, where two frames are exposed of each position, creates comparatively smooth movement, since the eye still fails to perceive the illusion in most circumstances: double-framing can be compared to shooting and projecting live action pictures at twelve frames per second. Three-frame animation is possible, but must be devised with special skill to avoid jerkiness of movement; some jerkiness is inevitable.

With four-frame animation the observable jerkiness of movement becomes a positive technical factor to be exploited—a form of skip-frame technique which can achieve certain kinds of comic effect.

Six-frame animation, and so on up to twenty-four frame animation (i.e. a series of holds lasting one second each), is frequently used on television. It creates a fantastic form of jerky action, and when still photographs are treated this way it gives the effect of pixillation. This gives the illusion that a photographed human character has been released from natural laws.

For camera movements (panning and tracking), single-framing is always necessary.

Visual literacy

In any medium, the communicator must be aware of what codes and conventions will be accepted by his audience. In a drawing, two converging lines can represent perspective; in a film, a mix can conventionally represent the passage of time. But whereas in live action pictures the camera essentially records reality, the images of animation are often more akin to words than to the perceived world. The idea of "visual literacy" (sometimes called "graphicacy") has been promoted by educators and graphic artists to emphasize that to "read" images requires skills of the same order as the skills of reading words. A serious animator must be aware of the visual literacy of his audience, and the sophistication of the signs and symbols, time cues and optical effects that he uses must be tailored to his audience's understanding of visual language, and their particular visual language. In some cultures, colour symbolism must take into account that white implies mourning. In the West, people tend to read pictures left to right and up to down as they do printed pages. In various Eastern countries, either or both of these directions are reversed.

The principle of visual literacy applies in character animation as in diagrams. Any departure from more or less realistic drawing relies upon varying degrees of response in recognition (or visual "reading". A type character—a scientist, for example, conceived in a few deft lines—must be instantaneously recognized for what he is. A character in white coat and glasses may suggest a doctor. Add an egghead rather than a stethoscope and he is more likely to be read as a scientist, as intended.

Suitable subjects for animation

The first essential of an animation idea is that it should be simple. The content should be straightforward—ifs, buts and exceptions do not come across well. The development of the story or argument should be linear rather than branching, and there should be a clear conclusion at the end, even if it is open-ended. Characters and all animated figures should be simple, too, in design, movement, role and function. The representation of a complex human personality, or of a machine with many moving parts, are both unsuitable for animation because they take too much time, effort and talent to be worth while for most purposes. Action (simple, fast and obvious) takes precedence over the observation of scene, character or undefined concepts. Dialogue should be as limited as possible—lip synchronization is one of the most expensive animation techniques. Scenes have to rely mainly on outlines around uniform tone or colour; fine detail, varying textures, and gradations of shading will usually be redundant or too difficult, except for backgrounds and then with great care. Except in expensive or experimental pictures the figures must nearly always be hard-edged and in flat colours, and so the film's idea must match the simple qualities of style in the final visual design.

Artwork

Overlays

Most animation artwork is drawn on cels: transparent sheets of celluloid. When different parts of a figure are animated at different times within a scene, each movement is drawn on a separate level of cel, and then all the cels are combined under the camera to produce a composite image. The technique was developed to avoid tracing still pictures again and again, and to speed up production, but its positive creative value is immense. One great advantage of overlays is that they permit a complex process to be examined stage by stage. Starting with one level of cel, then going on to two, three, four and five (the usual maximum), each part can be added in turn to the total until the whole process is exposed. The viewer can then see how each stage works, both individually and in relation to the whole process. Cels allow innumerable other possibilities: they can be moved independently of each other under the camera to produce linear movement of figures in the frame at different speeds; their peg bar registration allows mathematical precision in framing at every stage; and completely controlled fluid movement can be drawn on one layer of cel while other levels, if present, and the background, can remain completely stationary.

Scratchback

The technique employed here is a simple way of expressing growth of any sort. A single drawing is made, containing the whole development of the visual information. The animator can achieve a continuous, smooth movement by scratching off or erasing the drawing stage by stage between camera exposures, while the film is run in reverse. When the film is projected forwards, the illusion is created of the diagram being assembled in all its stages up to its full extent. Scratchback is particularly useful for graphs, words that write themselves, etc.

Cut-outs

Though cels offer an infinitely flexible technique, it is often more convenient to cut out the figure to be animated and move it manually under the camera between exposures. Rigid objects are most suitable for this technique, though elasticity can be expressed where necessary by substituting a squashed or stretched cut-out for the normal one rather than displacing it. Cut-outs can be moved freely in the plane of the artwork, whereas cel animation has to rely a great deal on linear movement, horizontal or vertical. A lot of artwork is saved by cut-outs, but it is often difficult to make them move smoothly and precisely enough for diagram work. By making a pivot in the background and attaching the cut-out figures to it, it is possible to create smooth rotation for such things as the hands of a clock, revealing sections of a pie, cog wheels, etc. Slices and joints in cut-outs can help to ensure smooth linear movement and maintain the cut-outs in the correct spatial relationship with each other.

Diagrams with live action

By combining animation with live action, it is possible to compare the living image with the moving diagram which simplifies and analyses its shape and the forces which move it. The combination can be effected most simply by cutting between live action and animation, designing the animation from a frame of the live-action scene, but they can also be combined in the same picture. The animated diagram can be used to simplify, analyse and express visible processes which would be inaccessible or unclear by live action photography. Its fullest capability, however, is in the presentation of processes which cannot be perceived in actuality. The forces of magnetism, gravity and electricity for example can be shown. The action of physical laws can be demonstrated, and the pattern of miscroscopic or cosmic events can be made clearly visible. Time can be expanded or contracted: events of a few milliseconds can be shown at length. The transformation of decayed animal organisms into oil, which took nature several million years, can be shown in a few minutes. Important elements in a process can be emphatically slowed down, or speeded up to show the underlying patterns involved.

Characters

Unless the animation is combined with live action, animated diagrams alone can never maintain the interest of any general audience for long, and so animated characters have a place even in the most didactic films.

Techniques of character animation have now reached a considerable degree of sophistication and variety. The commonest movements, such as walking and talking, can be produced by well-tested formulae which need little creative skill by the animator. Studios specializing in television series have sometimes developed the formulae to such an extent that the same drawings can be used over and over again in different scenes, films and even series.

Camera work

Camera techniques

The emphasis on artwork rather than photography can give the impression that camera techniques are not important; in fact, they must be taken into consideration from the idea stage. Although it is theoretically possible to make the artwork in such a way that it simulates all camera movements and effects, in practical terms the wealth of camera techniques available on a sophisticated rostrum camera makes an enormous contribution to the film, to such an extent that camera movement over a few still pictures can create a vital and energetic film in itself.

Camera movement

Tracking or zooming, panning (including tilting), and rotation are all referred to as camera movements although all functions except tracking are nearly always performed by movement of the animation table. In combination, camera movements can reach great complexity, and require advanced mathematical methods to be plotted smoothly and correctly. For simple tracks and pans, the camera movement is made at equal spatial intervals between exposures, but even in simple movement it may be necessary to calculate fairings at each end of the movement, to avoid the impression that the track or pan stops and starts abruptly. The intervals are progressively increased at the start of the camera movement and decreased at the end.

Camera effects

Fades, mixes, wipes, mattes and superimposition can usually be created in the animation camera rather than the laboratory.

Their techniques and applications are mainly the same as in live action work, except that fades are nearly always created by a variable shutter. However, the various double-exposure techniques are also widely used to save artwork time, camera time and calculations as well as to create special effects which cannot be produced in other ways.

The simplest camera effect to save artwork is the mix from one key position of an animated figure to the next, which creates a smooth transition without the necessity for creating in-between positions. Mixes are widely used for this purpose, and for mixing in titles and diagrams.

Superimpositions and mattes (inserted pictures, using a masking device) are often used in animation, though they may not be noticed on the screen. Black or white titles over animated figures are burned in by superimposition to save the work of placing the title over the artwork every time an exposure is made. Double-exposure is also used to create effects such as fire and smoke, mist or fog, rain, water, or underwater photography.

To combine live action with animation, a special bi-pack film magazine can carry the processed live scene and the raw stock. The artwork will be black except in the areas where the animated figures are to be inserted. Alternatively, back-projection techniques can result in the same final effect.

Lighting

The lighting for animation must be uniform all over the artwork and throughout the duration of photography. Frequent checks must be made to ensure this is the case. For work in colour, the light must also have the right colour temperature for the stock, and gels are often placed over the light, the lens or the artwork to create colour effects economically and effectively.

Camera exposure charts

All camera movements and effects are usually calculated some time before the actual photography. The animator gives precise instructions to the cameraman in the form of camera exposure charts (dope sheets). These list every frame of the film, and note the action, sound, camera movements, field sizes, panning figures (on travelling peg bars), cel levels and camera effects. In addition to the dope sheets, there may be layouts which show the spatial relationships and speed and direction of movement of the animated figures as well as of the camera movements. These are sometimes known as spacing guides, or guide lines.

Production processes

Treatment and storyboard

The production of an animated film usually takes the following course. A written treatment is needed to set down an outline of the story or action. This determines the main dramatic development of the film and the part the various characters will play in it; at the same time, the directing animator makes his preliminary sketches which begin to disclose the visual nature of these characters and the general graphic design of the film.

The treatment is expanded until the action in each shot is predetermined, together with key sound effects, music and voice. From this script a working storyboard is made. There may be about fifty 3 in by 4 in drawings for each minute of film time, drawn in pencil with arrows in a different colour to show the movement.

Sound

Sound can be so exactly timed in the animated film that every word, musical note or sound effect can be exactly synchronized to the action. In most films, the final sound track is recorded before the animation is done, and the timing of the animation depends on the sound rather than vice versa.

The kind of sound appropriate for an animated film is usually rhythmical and artificially produced. Natural sound effects often jar against the artificiality of the characters, and even dialogue is often speeded up, slowed down, or spoken in a distorted way. Music of all kinds usually works well with animation.

Planning the movement

Parallel with the storyboard come the research drawings for characters and backgrounds. The essential composition for each character must be simplified in such a way that a chain of artists of varying seniority can contribute to its realization through thousands of repeat drawings.

Once the visual essentials—representing not only basic expressions seen from varying viewpoints, but the scale of the various parts of the face, head and body—have been agreed, then the key or principal animators can begin to work out the actual movement which will bring the characters to life. For this they may well need some form of pre-recording of voice and music in order to achieve a witty or apt synchronization of their drawn movements with the sound.

Many, though not all, cartoon films have their tracks pre-recorded so that the animators may hear them constantly played back for appropriate matching when they begin the laborious task of rendering in successive phases each record of the action, including lip-synchronization with the dialogue. This, for a sound film, means twenty-four phase-drawings for each second on the screen, though in practice there are many short cuts in the process of realizing movement in these terms. Movements and points of characterization may be rehearsed by means of photographed pencil tests, that is, animated sketches projected on the screen to check the effect of details in the action.

The final animation

For full-scale animation, an instructional work-book is drawn up by the director from the script and storyboard, giving shot-by-shot and frame-by-frame, every detail of timing, camera movement (if any), and shot punctuation. This work is essential alike to the composer and the animator, especially when the music, voices and effects are to be composed and pre-recorded before the final animation begins. The music and dialogue may need special time charts to guide the composer, while the cameraman, who is to photograph each batch of backgrounds and cels, needs a camera-exposure chart (or dope sheet) to give him his instructions which are derived by the director from the work-book.

Photography

The cameraman, following the camera instruction chart, positions the background on the rostrum table below the camera, and places the appropriate set of celluloids (through which the animation is created over the background) on to the registration pin bars which hold them firmly in position. He presses a glass sheet over them in order to keep them meticulously in place while he exposes the film for one or more frames according to the camera chart.

Then he prepares for the next change; this might involve the adjustment of the celluloids and the registration bars in order to achieve a panning movement in the backgrounds, or adjustment of the camera position in relation to the rostrum table for a tracking movement. Panning movements usually take place on a horizontal plane by adjusting the rostrum table in the desired direction and distance by means of precision-made lead screws.

The cameraman must be highly meticulous in his adjustment of lead screws and selection of celluloids. Every celluloid must be clearly numbered, and listed in the correct order on the camera exposure chart. For camera effects, even more attention to detail is necessary.

When the photography is completed and the film processed, editing follows. This will usually consist of removing bad takes, splicing the scenes into the pre-determined order, and laying the tracks of the pre-recorded sound track.

Object animation in three dimensions

The different methods and styles of animating drawings can often be used with objects. It can be very useful in demonstrating certain processes and operations where the spatial nature of the models is of prime importance. Molecular construction, for instance, can be handled by this technique.

The substances from which the model is made may range from carved wood to various pliable plastics, or even better, wire constructions. This form of animation may demand an entirely new puppet or model for each exposure, or the puppet or model may be constructed in such a way that a single one may be operated throughout the whole sequence.

The objects to be animated remain motionless during the exposure of each frame. After the first phase has been recorded on the first frame of the film, the aspect of the objects is modified by the animation team while the shutter is closed. This second aspect (or phase) is then recorded on the second frame, and so on. The frame-by-frame changes in the aspect of the objects can be made in the following ways:

1. Modification of lighting and exposure.
2. Shifting the position of the camera or the objects.
3. Movement of articulated objects.
4. Substitution of objects. (This last is the most difficult, the costliest, and the most versatile method of the four.)

Economic factors

Animation costs like those of any manufactured article, depend on labour, time and material, with the difference that the process of manufacture requires a high degree of both aesthetic consideration and technical knowledge. Generally speaking, the slow animation of simple shapes on a plain background requires the greatest precision of animation technique; mistakes and imperfections may not be noticed in a complex, fast-moving scene. In an apparently simple animated title sequence, there may often be a great expenditure of time and talent.

Only those who know animation well and, in the case of technical films, have acquired a sufficient grasp of the given subject under the guidance of an expert can appreciate the innumerable different animation approaches and decide which is the one best suited to a given film or film sequence.

The longer the time spent on planning, the greater the chances of solving the problems of animation economically. For this reason, it is always advisable to invest more money at this stage in order to spend less on production.

All categories of animation films, ranging from diagrammatic cut-out films through to fully fluid cel animation and articulated puppets, can be either cheap or expensive depending among other things on the type and amount of movement. A complex animated diagram may cost much more than a simple story of characters who are cleverly designed to be stationary during much of the film. In all animation, movement should be used as sparingly as possible; it is often sufficient for only one figure to be moving at any one time.

As animation is often expensive in comparison with live film production, its practitioners have always had to cut corners and find new ways of doing things more cheaply. The development of animation techniques has been an exercise in seeking out the least expensive methods of creating movement.

Chapter 8

Production and recording

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Harry Myers
Tan See Lai

We have now looked individually at the various strands which make up a production, and have arrived at the point where they are re-assembled (Phase 5 of the network in Fig. 1). The period of production and recording is a relatively short span of time; it begins with the stage of rehearsal, leading directly into studio production.

Outside rehearsal

Most programmes require some rehearsal outside the studio; studio time is expensive, involving both technicians and equipment. This can range from several weeks for a drama production, to a single afternoon for a production with little more than a presenter, but both are equally worth while. Drama productions normally rehearse in specially acquired rehearsal rooms (often a rented hall). The floor is marked up to show the position of sets and furniture, usually with lengths of adhesive tape (better than chalk), and rough versions of essential properties are also imported. The marking up must be precise and to scale, otherwise actors will become used to working in wrongly proportioned surroundings. In larger organizations, this is normally the job of an assistant floor manager, but the job may be undertaken by any member of the production team who has some time to spare.

Rehearsals normally begin with general readings, and moves are gradually blocked in. Towards the end of the period, the producer/director[1] is able to visualize the final nature of his camera shots, and often has a view-finder to assist him (a kind of telescope, which allows him to see the view of the camera from different lens angles). Towards the end of the period, also, technical staff are invited to attend a rehearsal, to make sure that the production still reflects the planning which was agreed some weeks earlier, and to determine whether any new technical problems have emerged.

For the most part, educational television productions do not demand this degree of complexity in rehearsal, but even in the simplest productions, a walk-through should be arranged, to familiarize the presenter with studio layout, and to allow him to develop a sense of the production. Additionally, a number of script rehearsals should be organized, and where demonstrations or

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1. In an earlier chapter (Part I, Chapter 1), it was noted that the functions of producer and director may be separated. In ETV, however, more often than not, they are combined, and for the rest of the section the term "producer" is therefore employed.

experiments are a critical feature, these should also be rehearsed, if possible on the actual apparatus to be used.

Rehearsing the presenter

The first step is to have the script written in the presenter's own words. Even after a script has been agreed and discussed with the script-writer, the presenter can re-write it here and there, inserting phrases and words which he normally uses. One must naturally watch out for over-use of set phrases like "You can clearly see", "And now let me show you", etc. Also vital cue-in and cue-out lines should be discussed, so that he will not *ad lib* at the wrong place during performance and ruin essential camera shots.

Briefing should also be given on the use of television terms, characteristics of microphones, off-camera commentary, on-camera deportment, handling of props, what to wear, use of studio monitors, cue lights, and the functions of each member of the studio crew.

Movement should be carefully rehearsed. It is important to control excessive body and hand movements while on camera. There is of course no need to act as if wearing a neck brace, but excessive or jerky hand and torso motions should be avoided. In general, one moves from place to place and picks up and demonstrates objects more slowly and deliberately on television than in a conventional classroom. With practice the presenter will learn how to "signal" movements to the cameraman before moving, so that the latter will be able to follow him smoothly.

Bearing in mind that television is a visual medium, it is not necessary to keep up a constant stream of words to the camera in order to hold attention. A simple movement, such as walking from a desk to a blackboard, is in itself an attention-holding technique.

In addition to being visually revealing, television is aurally revealing. Whispers and other extraneous noises are picked up on the sensitive microphones. The presenter should speak with slightly less than his normal volume; however, he should not become absorbed with the mechanics of the vocal process, listening to his own voice and speaking with a pride in how he is saying it, but should "think the thought" instead. The microphone reveals much about speech and personality.

The presenter's script

The presenter should learn his script; there is no substitute for commital to memory, and in particular, cues must be learnt thoroughly. On cue lines, on which the producer calls for a change of shot, the presenter must be exact.

In many organizations, a teleprompting device is used, in which the typed script is reflected directly into the camera lens, so that it can be read. An operator controls the speed of this device, and it is possible to make limited cuts or alterations, even at a relatively late stage.

The use of the teleprompter is a subjective matter, but it does have a number of disadvantages. First, it necessitates the camera wearing a fairly bulky hood, which can disturb camera balance and movement. More important, however, is the difficulty which it poses to the performer. It takes an experienced presenter to use a teleprompter with naturalness; at times he may have a glazed look as he reads the text. It may also make him very dependent upon the mechanics of the instrument, so that if there is any form of technical hitch, he cannot cope.

Probably the most serious drawback for educational television (apart from the cost of acquiring and operating the device, which can strain limited resources), is the way in which a "read" script can prevent the presenter from coming directly to grips with his audience, concentrating his attention on what he is teaching or demonstrating. While it is in the end a personal judgement, the use of the teleprompter should be carefully rehearsed, and the producer should be well satisfied that in gaining exactitude, and an assured cutting point for his shots, he is not losing conviction and spontaneity.

The life belt for the presenter who is without a teleprompter and who cannot learn his script throughly is the prompt card or "idiot card". These are large cards with the text of the programme hand-printed on them in capital letters, or more frequently merely headings and cues. Professional actors are superb a reading from cue cards without the audience knowing they are doing it, but most amateur performers are poor readers, and usually a stilted delivery results. The presenter can alternatively have the script concealed out of the camera range, and read from it when a long series of pictures or a film sequence is on the screen, but is should be disposed of at least a full page before the camera is due to return to him.

The presenter can also help himself by writing a key-word or key-phrase outline that will serve to keep him on the track of the information being presented. These can be written on 3 in by 5 in cards that can be held in the hand. They should not be written on standard paper as paper noise is easily picked up by microphones.

The camera script

In the closing stages of the outside rehearsal period, the producer is called upon to write the camera script. However simple or complex the production, this is a critical phase, because it is in the camera script that the interrelationship of all programme resources becomes fully evident, and a competent producer can tell, by looking at the camera script (even of a production which is totally unfamiliar to him), what it should represent upon the screen.

There are a number of ways of laying out this script, as each organization develops its own house style, but all are serving basically the same purpose.

The script is divided into two columns: one for vision, one for sound.

In the vision column, various items of information have to be recorded, namely (a) the shot number (each shot change is numbered, to allow for ease of reference); (b) the camera number (each camera is given a separate number); (c) the camera position (every major position taken up by a camera in the studio is given a letter which corresponds with a marked position on the camera plan); (d) the shot to be taken by the camera (plus additional movement required during the shot by that camera). In the sound column, the major item is the programme dialogue. But the following are also necessary: (a) the microphone boom identification (normally given a letter)[1]; (b) the position of the microphone boom (indicated by a number); (c) music, sound effects, etc., which are relevant to the scene.

Additionally, every sequence or scene

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1. In this way the camera and boom notations are separated.

needs identification, and its location and lighting condition has to be shown.

In writing the camera script, the producer is working from a camera plan, which he has drawn up after consulting with his technical advisers. The position of the sets has been marked to scale, and the general disposition of cameras which was discussed at the technical planning meeting (to ensure that there are no problems with cross-cabling or cable reach). Subsequently, the producer determines more specific positions for each camera and boom, and adds the identification codes cited above. The plan then not only guides his work; it is reproduced, distributed and placed in the studio, so that all technicians can also have access.

A simple example of a camera plan is reproduced below (Fig. 43). As an illustration, the following script segment could be associated with this plan:

1. Cam. 1A MLS PRESENTER	What do you think this is?
2. Cam. 2A CU STAMP	It's small, square, with something printed on it. At one time it was worth only a penny . . . but now it is worth a very great deal more.
3. Cam. 1A MS PRESENTER	It's a postage stamp, to put on a letter. But it's a very old stamp, and that is why it is so valuable.
4. Cam. 2A 12 in by 9 in CAPTION. (Stamp on envelope.)	Value is very often a matter of rarity.

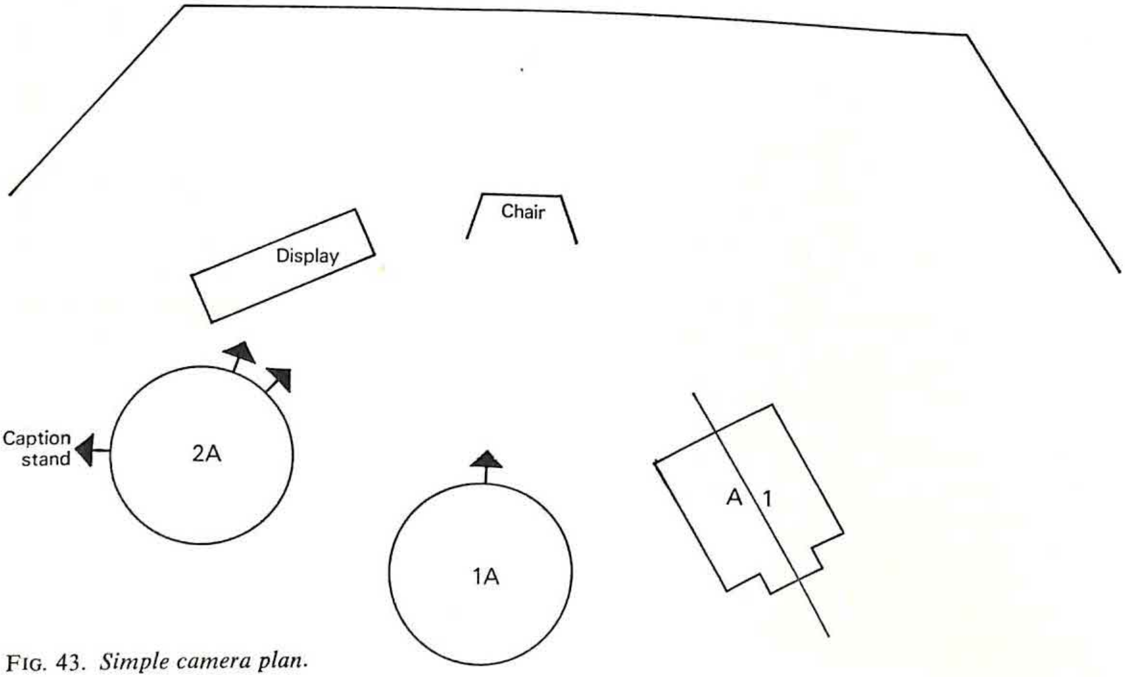


FIG. 43. *Simple camera plan.*

Looking back to our earlier description, we can see that all the relevant information has to be included—shot number, camera number and position, nature of shot, boom and boom position, and dialogue. (The word "cut" could also have been added to show the kind of shot change required, but as the cut is a standard change, it is often omitted. Other shot changes (cf. mix, wipe) are always inserted, so that in the absence of contrary instructions, a cut is assumed.)

Of course, most sequences are much more complicated, but once the language is understood, there is little difficulty in visualizing the whole. For example:

7. 1A MLS PRESENTER. Pan him L to display	Here is a whole collection of valuable objects. *(He walks to display.)*
8. 2A CU DISPLAY. Pan R to L across objects	They are a mixed bag, aren't they? A coin, a picture, a letter. . . . But each of them is either unique, or very rare.
9. 1A MS PRESENTER	What do you think of as being the most valuable thing you know?
Run telecine MIX	Probably gold.
10. TELECINE (bank sequence)	Here is gold—lots of it—in the vaults of a bank.
11. S/I 2 12 in by 9 in CAPTION (bank vault) FO 2	Gold is also a precious metal because it is rare. In fact, the supply of gold—even the mining of gold—is strictly controlled to make sure it holds its value.

In this example there are a few more instructions. A camera movement is added to shot 7; a film sequence is included (shot 10); a caption is superimposed over film (shot 11), and then faded out. The basic principles, however, remain identical.

Reading—and writing—camera scripts is a matter of experience. A considerable amount of imagination is required, and careful planning, both to visualize the potential of camera movements and to ensure that the action runs smoothly, without equipment and personnel getting into each other's way. A more complex example, for illustration, is the following—though this drama script is the kind of format which only comes with practice.

The script should be read in conjunction with the plans also reproduced. The first plan (Fig. 44) shows the over-all layout of cameras deployed in the studio (in this example not numbered); the other plans (Figs. 45-46) give a detailed description for each of the sequences 17, 18 and 19.

As this is an exercise in script reading, the context of the script is not important. However, for interest, the excerpt is from a documentary play, dealing with the misfortunes of an adolescent boy, an orphan, who is constantly in trouble. He is in the hands of a probation officer (a social worker, named Southam). In these final scenes, the social worker is called to remonstrate with the boy, Johnnie, in a voluntarily run hostel for "down and outs", where he has habitually taken shelter with the hostel warden.

The scenes begin in Southam's home, as the telephone rings.

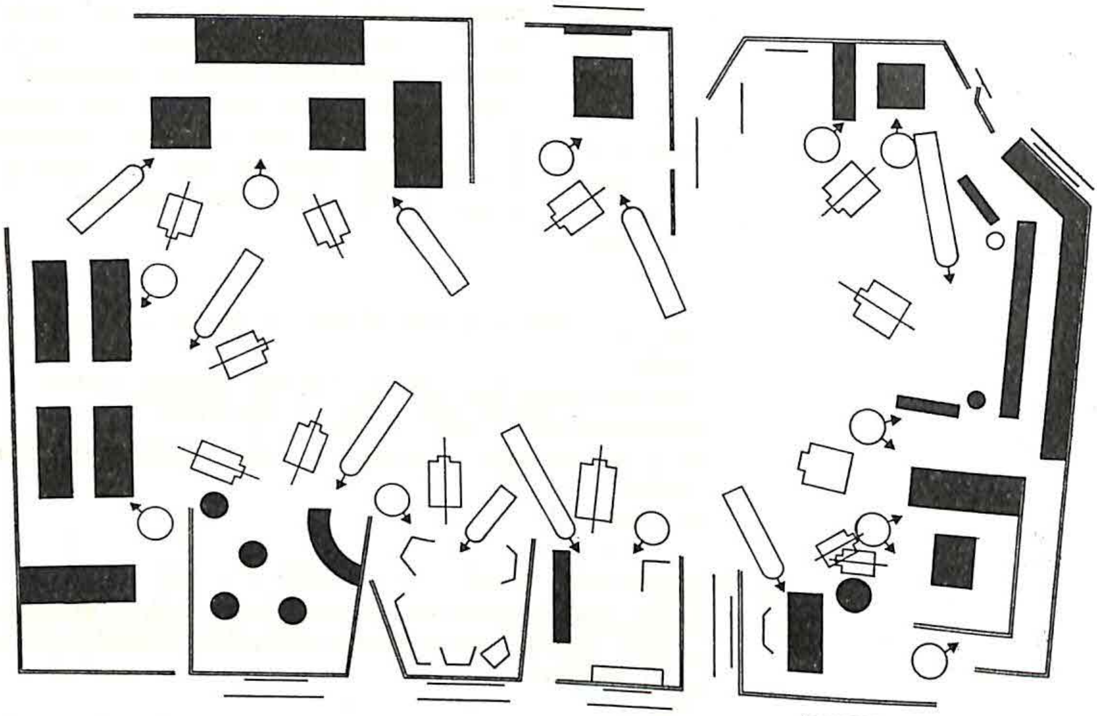


FIG. 44. *Studio plan with rough camera layout.*

Studio sequence 17[1]

Interior, night
Southam's house

216. Cam. 4F MLS SOUTHAM'S LOUNGE (through room divider). Track back to hold phone in foreground	*The probation officer and his wife are having supper.* */Q/ The phone rings.* *Southam puts down his knife and fork, looks across the table at his wife.* *Stand-mike/C5.*
217. Cam. 5D 2-shot MR AND MRS SOUTHAM	*Mrs Southam:* Go on, answer it. It'll be for you. (Southam goes over to the phone.)

[1] For ease of reference, two conventions often used in camera scripts are omitted from this example. First, a line is frequently drawn across the page from the camera and shot number in the vision column to the sound columns to indicate the exact point in the dialogue where a cut is to be made. This is necessary when cuts are made on specific words which may occur in the middle of a sentence. Second, telecine sequences are frequently separated from studio sequences by double lines drawn across the page, before and after each film sequence.

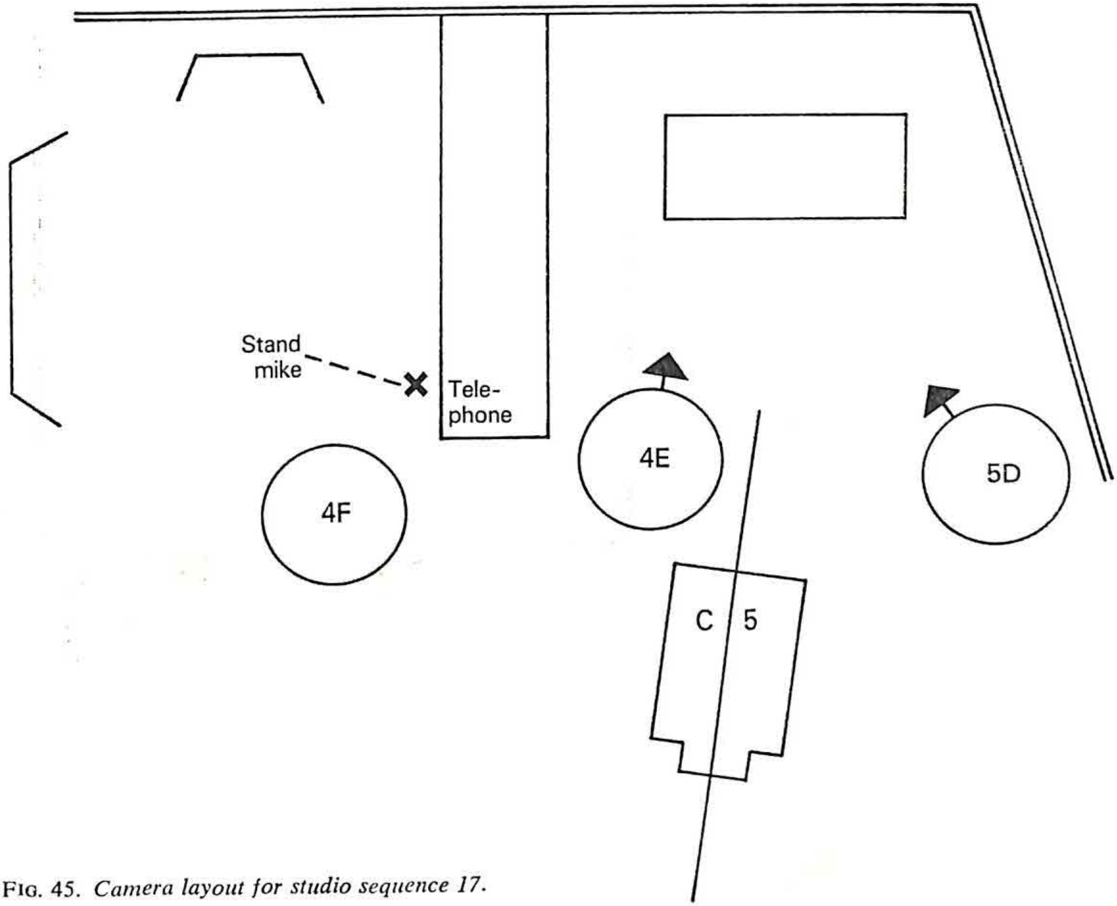


FIG. 45. *Camera layout for studio sequence 17.*

218. Cam. 4F MLS a/b. Track back as Southam takes phone. Crab R to hold Southam L of frame and dining room beyond	*Southam:* Southam . . . Oh, hello . . . No. That's all right. *(He puts his hand over the mouthpiece.)* It's Nick. *Mrs Southam:* Nick? *Southam:* At the hostel. *Mrs Southam:* What does he want? *Southam:* Something to do with Johnnie. . . *(He carries on listening.)*
219. Cam. 5D MS MRS SOUTHAM	*Mrs Southam:* Not Johnnie again?
220. Cam. 4F MLS a/b	*Southam:* What's that? . . . No, don't get the police in. I'll be right round. *(He puts down the phone.)*

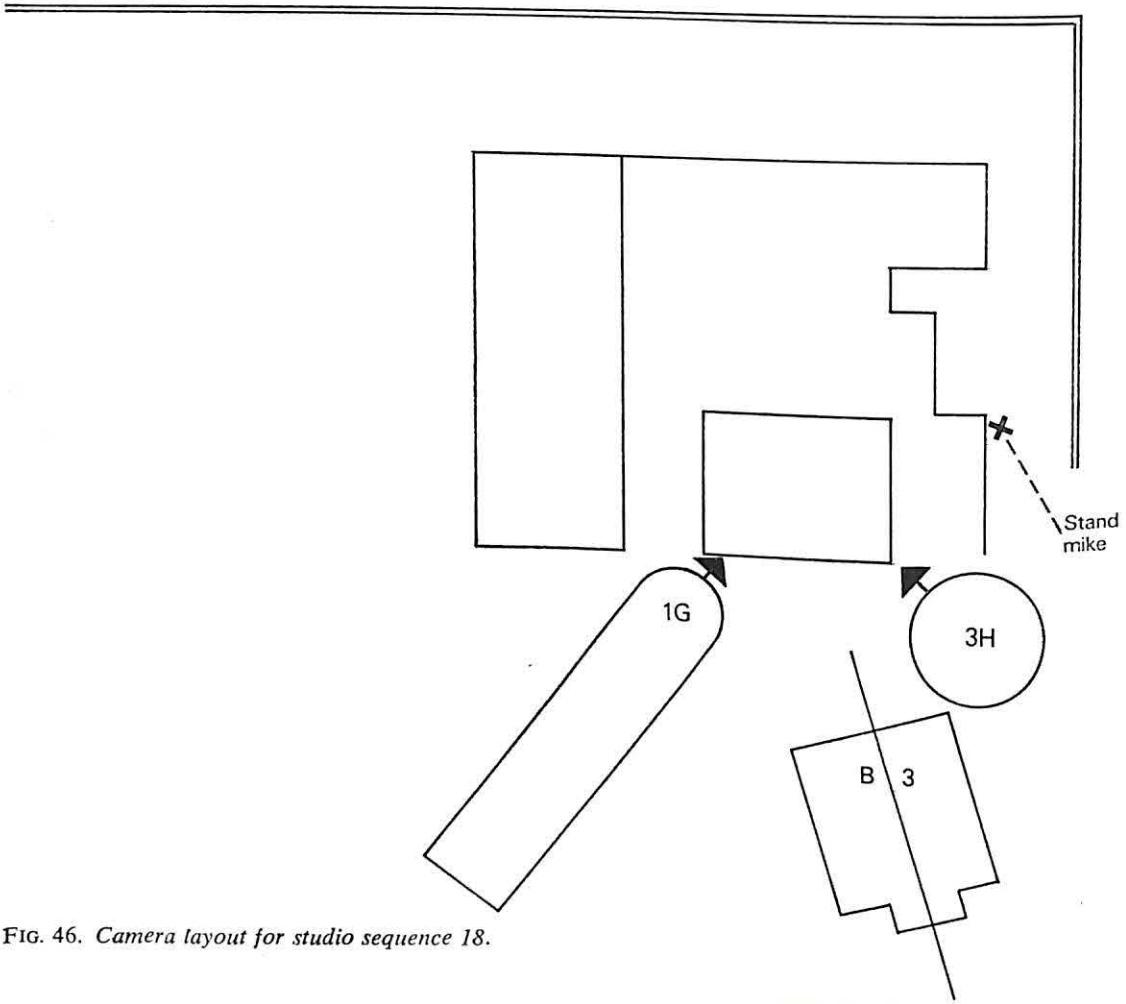


FIG. 46. *Camera layout for studio sequence 18.*

221. Cam 5D MS MRS SOUTHAM. Track out to hold Southam as he comes into shot (4 to 4E)	*Mrs Southam:* Bill, you're not going out. You haven't even begun your supper. *(Southam goes across, puts his arm around her.)* *Southam:* I'm sorry love, I've got to go. It really is an emergency. *Mrs Southam:* At least have your supper first. *Southam:* I can't. I'm sorry but he must have gone mad down there; breaking the place up.

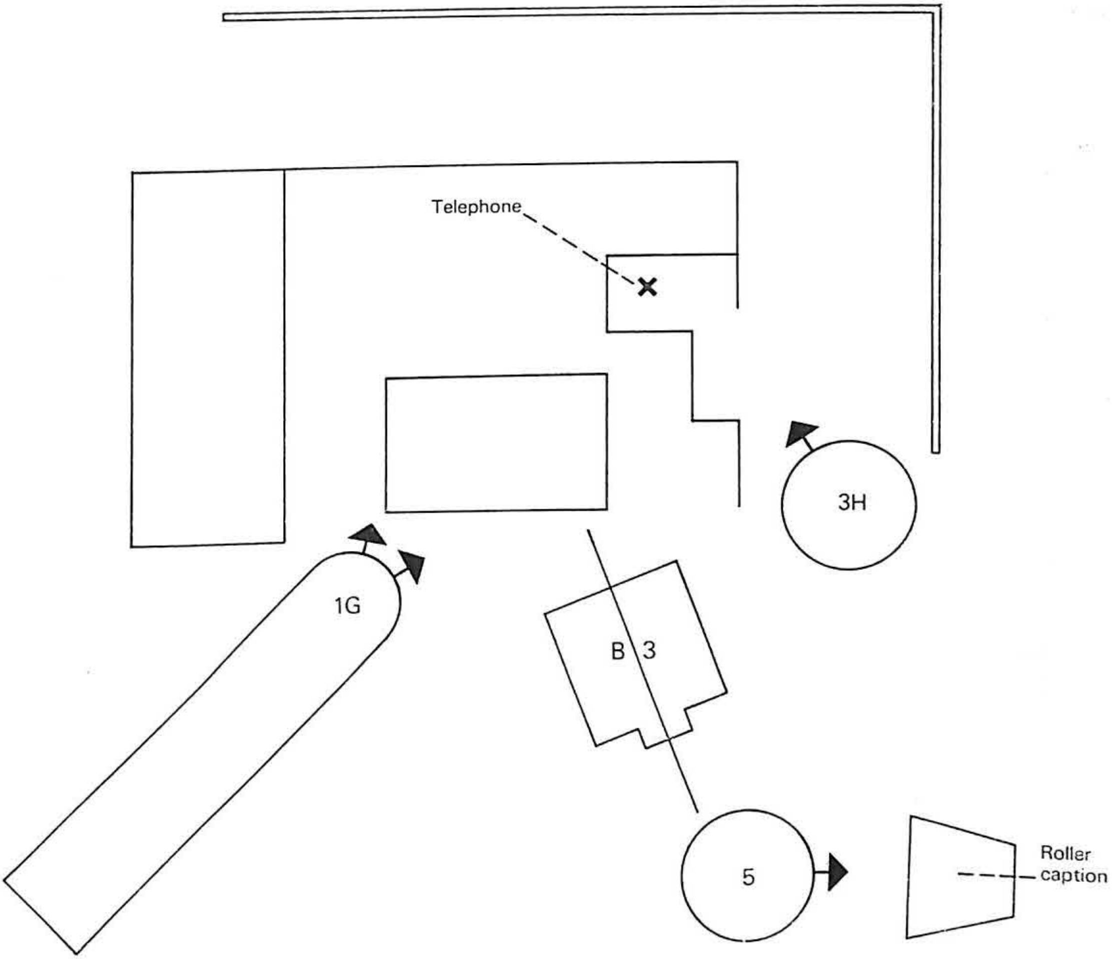


FIG. 47. *Camera layout for studio sequence 19.*

222. Cam. 4E CU MRS SOUTHAM	*Mrs Southam:* Sometimes I wonder who is more important, the Johnnies or us. *Southam:* Please love, not now. *Mrs Southam:* When? All right, off you go.
223. Cam 5D MLS DINING TABLE (SOUTHAM/MRS SOUTHAM) Track into M-2 shot	*(Southam puts on his hat and coat.)* *Southam:* Don't wait up for me. *Mrs Southam:* Do you want me to keep your meal hot? *Southam:* No, don't bother. *(He kisses her.)*

224. Cam 4E CU MRS SOUTHAM	*Southam:* I'm sorry love. *(He goes out of frame.)*
Studio sequence 18	
Interior, night The hostel MIX	*B3*
225. Cam. 3H CU CIGARETTE being lit. Track out to M-2 shot (JOHNNIE/WARDEN)	*Johnnie is sitting in the kitchen. He is quiet now. The warden sitting next to him offers him a cigarette. Johnnie takes it, accepts a light, but says nothing. Southam comes in.*
226. Cam. 1G MLS TABLE. (Southam's head appears in hatchway. He comes into kitchen, and sits down at table)	*Southam:* Hello Nick. *Warden:* Bill . . . come in. *Southam:* All quiet?
227. Cam. 3H M X-2 shot (WARDEN/SOUTHAM)	*Warden (nodding):* I'll leave you to it. *Southam:* You didn't? . . . *Warden:* No. I'll be round the corner if you want me.
228. Cam. 1G MLS a/b (Southam moves into seat next to Johnnie) Tighten shot to medium 2-shot (JOHNNIE/SOUTHAM)	*(The warden goes out. Southam sits down next to Johnnie.)* *Southam:* You didn't turn up tonight.
229. Cam. 3H MS JOHNNIE	*(Johnnie is silent.)*
230. Cam. 1G X-2 shot (JOHNNIE/SOUTHAM)	*Southam:* Why not? *Johnnie:* I'm not taking that job. *Southam:* You don't know what it is. You don't even know there is a job. You didn't turn up.
231. Cam. 3H MS JOHNNIE	*Johnnie:* There's always a job. That's what you're paid for . . . to find me jobs.
232. Cam. 1G MS SOUTHAM	*Southam:* As it happens you're lucky. There is a job for you. It's still open. *Johnnie:* I don't want it. *Southam:* You won't get another one like it in a hurry.
233. Cam. 3H CU JOHNNIE	*Johnnie:* I'm not taking it.
234. Cam. 1G CU SOUTHAM	*Southam:* Look, Johnnie, what's been going on here? *Johnnie:* Didn't he tell you? *Southam:* Who?

235. Cam. 3H CU JOHNNIE	*Johnnie:* Him, you know who I mean. He rang you up, didn't he? *Southam:* He just said you started a fight. You were trying to break the place up. *Johnnie:* That's right.
236. Cam. 1G CU SOUTHAM	*Southam:* I thought you'd stopped fighting. *Johnnie:* When was that? *Southam:* This morning.
237. Cam. 3H CU JOHNNIE	*Johnnie:* Why, what happened this morning?
238. Cam. 1G CU SOUTHAM	*Southam:* Come off it, Johnnie. We had a talk this morning, remember? I thought we had straightened out a few things . . .
239. Cam. 3H CU JOHNNIE	*Johnnie:* Well, this isn't this morning. *Southam:* . . . such as what's going to happen if you break probation. *Johnnie:* I go back inside. It suits me fine. *Southam:* You want to go back to prison? *Johnnie:* Yes . . . *(He shouts suddenly)* YES.
240. Cam. 1G CU SOUTHAM	*Southam:* What's the matter?
241. Cam. 3H CU JOHNNIE	*Johnnie:* Why don't you give up? Nobody will blame you. You've done what you could. Honestly, you've done your job. Give it up.
242. Cam. 1G X-2 shot (JOHNNIE/SOUTHAM)	*(Southam says nothing.)* *Johnnie:* Why do you have to try so hard? *Southam:* I haven't given up.
243. Cam. 3H M-2 shot (JOHNNIE/SOUTHAM)	*Johnnie:* Well, I have. Look, I'm fed up with being on my own. I'd rather be anywhere, even in prison, so long as I don't have to be alone.
244. Cam. 1G X-2 shot a/b	*Southam:* Sleep on it. It will seem better in the morning.
245. Cam. 3H MS JOHNNIE	*Johnnie:* Oh, do me a favour. You know better than to try that. I don't want a job. I don't want anywhere to live and I don't want an hour a week with you. I want to go back to prison. Anywhere, so long as I don't have to carry on alone. *Southam:* I thought you hated all those places?
Track into MCS JOHNNIE	*Johnnie:* At least you get fed. You get a bed. You don't have to go out and look for it. They don't like you much, and they show it, but they've got to look after you. That's their job. They get paid for it.
246. Cam. 1G MCS SOUTHAM	*Southam:* You can't spend your whole life being looked after. You aren't a child.

247. Cam. 3H MCS JOHNNIE	*Johnnie:* I don't want to talk about it. *Southam:* Johnnie, you are throwing it all away, you know.
248. Cam. 1G X-2 shot (JOHNNIE/SOUTHAM)	*Southam:* Give it another try, I mean it, or you'll regret it later. *Johnnie:* Are you going to call the police? *Southam:* No, I'm not. *Johnnie:* Have I got to break the whole place up first? I don't want to. *Southam:* You won't do that either.
249. Cam. 3H M-2 shot (JOHNNIE/SOUTHAM)	*Johnnie:* All right. There are plenty of other places. *Southam:* At least leave it till tomorrow. *Johnnie:* If I've got to, I'll break every window in town. *Southam:* Then you'll have to do it on your own.
250. Cam. 1G H/A MLS (JOHNNIE/SOUTHAM). Tilt down as Johnnie leaves. Warden comes in, sits down joins shot. Run telecine	*Johnnie:* Suit yourself. You'll soon be hearing from me. *(He gets up.)* You don't want to take things so hard. It won't do you any good. *(He goes out. Southam remains sitting. The warden comes back.)* *Warden:* Any luck? *(Southam shrugs.)*
Film sequence 10 *Exterior, night* Outside hostel	
251. TELECINE 12	SOF *Johnnie comes out. It is very cold. He turns up his coat collar. He looks back for a moment, then strides off in the direction of the city.*
Studio sequence 19 *Interior, night* The hostel-room	
	B3
252. Cam. 1G MLS TABLE Crane up as Southam gets up to answer phone	*Southam and the warden are sitting silently.* */Q/ The phone rings. Slowly Southam gets up to answer it.*
253. Cam. 3H CU PHONE (through hatchway)	
254. S/I 5 (roller caption) FO 5 FADE VISION	*Hold phone under closing titles.* FADE SOUND

Studio production

Actual studio rehearsal time varies from a bare hour to a process which continues over several days (in the case of complex drama productions).

In all cases, however, this follows a basic plan: set and light; camera rehearsal; recording. For a straightforward educational production, the whole sequence will be compressed into perhaps 2 hours of camera rehearsal, and a 45-minute recording period (allowing time for retakes).

Set and light

Before the rehearsal begins, sets have to be erected, and basic lighting positions fixed. For complex productions, sets are often erected over-night; in educational television where sets are usually less intricate, an early morning period will suffice. Lighting is also rigged before the remainder of the technicians arrive; the lighting plot has been pre-determined, after the early technical planning meeting, and thus light placement is a matter of setting lamps in the correct positions.

At this early period the designer is present, to check on set placing, and to supervise the "dressing" of the sets (properties, furniture, etc.). Members of the production staff will also be in evidence, if they are wise, to familiarize themselves with the studio layout and to try to foresee difficulties.

Personnel

The number of people present in the studio naturally varies from service to service, but they fall into three main groups: production staff (producer, director, production assistant, script assistant); technical staff (cameramen, audio operators, lighting assistants, camera-control operators, vision mixer/switcher, technical supervisor staff); service staff (designer, scene or stage hands, caption changers, property men). Some functions will often be combined, and overall numbers can range from a bare dozen to more than fifty.

The roles of most of the above have already been described, but it should be added that the "floor manager" is responsible for discipline and co-ordination on the studio floor, and for cueing actors; the "assistant floor manager" handles properties, and makes sure that performers are ready in time; "caption changers" order and manipulate captions (both graphic and animated), and assist with demonstrations; and "scene hands" set, and strike, scenic items. In many drama productions, the production assistant works on the studio floor, assuming the role of the floor manager.

Camera rehearsal

At the beginning of the rehearsal, cameramen and technicians are ready at their equipment, performers in their opening places, and in the control room the producer and his staff are seated. Figure 48 shows characteristic layouts for control-room areas: one for larger, more complex installations (with a division into vision control, audio control, and lighting control), and the second for a smaller studio complex, where technical personnel are fewer and operational demands less. The division into separate control areas makes for efficiency

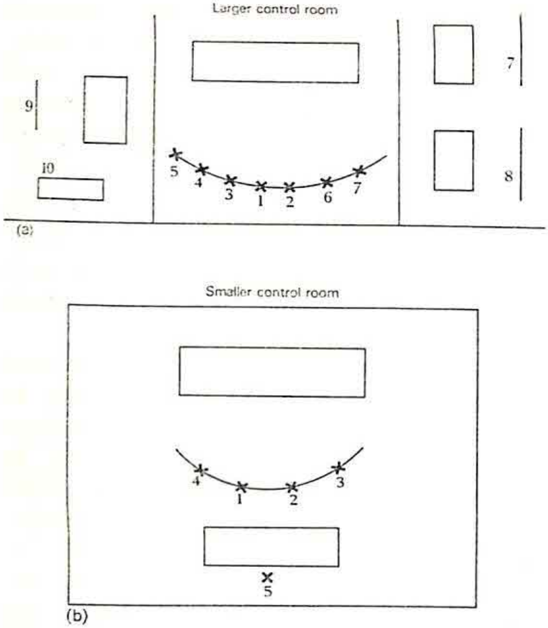


FIG. 48. *Characteristic layouts of control room. (a) Larger control room: 1, Producer/director; 2, Vision mixer (switcher); 3, Script assistant; 4, Designer; 5, Wardrobe/make-up; 6, Technical producer; 7, Camera control (alternative positions); 8, Lighting control; 9, Audio control; 10, Audio effects. (b) Smaller control room: 1, Producer/director; 2, Vision mixer (switcher); 3, Camera control/technical operations; 4, Script assistant/design/make-up; 5, Audio operations.*

in larger installations, where it is advisable to separate different technical functions; in smaller services, there has to be much more flexibility and sharing of roles, and this is easier if technicians are together. But, if possible, some separation of audio operations at least is preferable, as these require higher, and better isolated, sound levels.

It should be emphasized, however, that these layouts are for illustration only, and, in practice, different combinations are often found. The relationship of the control desk to the monitor bank is one example; sideways, even backwards, layouts are found, as well as frontal. The position of the camera-control operator in larger studios also varies, depending upon the kind of equipment in use; when the main controls are withdrawn to a separate area, and remote "joystick" controls are employed, the operator is usually in the production control area.

Similarly, in smaller studios, the functions of producer and vision mixer, or switcher, may well be combined, and the rôle of script assistant may disappear altogether. It is the relationship of the various production and technical members of the team, rather than their location, which is most important to bear in mind.

The functions of the staff in the vision control room have already been described in general terms (see Chapter 6, "Technical Operations"). In audio control, one operator mixes different sound sources; if gramophone and tape effects are to be included, a second effects operator may be required.

Lighting control is by dimmers, which increase or lower the intensity of the lamps on the studio floor. Camera control is a technical function, which determines electronically the grading of the picture (and also produces, in educational television, the "black crushing" which is used in studio animation work to make the joins in the animation invisible).

Telecine machines (for film inserts) are normally in a separate telecine area (though again in smaller installations they may be in the same room, or adjacent). The same is true of videotape recorders. Designers of studios are faced with a constant dilemma—to separate technical functions, allowing for efficiency, while at the same time permitting ease of communication. It is as well, therefore, for immediate operational areas, like telecine and videotape suites, to be as close at hand as possible, and in smaller services, where operational staff are few in number and are likely to be asked to perform a number of functions, visual communication is highly desirable. It is for this reason that glass panels are normally inserted (adequately soundproofed) between related control areas. As each shot comes up, the script assistant (or if there is no script assistant, the producer himself) calls the shot number, the camera on air, and the next camera, as follows: "Shot 5—on 1—2 next."

So a running check is given on which point in the script has been reached. The producer also indicates the exact cutting or mixing point, calling "cut 1" or "mix 2", and cues camera movements when these are required during a shot; likewise, he instructs the floor manager to cue action or speech. As the rehearsal progresses, he will need to speak less, as the cameramen and switcher come to understand movements and cutting points. Telecine and videotape inserts are also cued in advance, either by the producer or by the script assistant (unless there is a remote control start button available, which is on the production control panel). Telecine is cued (for sound on film sequences, where a run-up time is required, to get the projector to speed) 8 seconds in advance of the cut to telecine, and for this purpose a film leader is attached to the front of each film sequence, numbered from ten downwards, and ending in a few seconds of blank screen to cover the actual cutting point. For this reason, exact cues are needed from the presenter, if telecine entrances are not to be premature or delayed. It is the point at which changes are made from studio or to film, or between complex graphic and demonstration sequences, that the presenter's accuracy and speed of delivery is most important, since it directly affects technical processes.

All operational staff have picture monitors available to them, and loud-speakers to relay studio sound (though this is held at a low level, except in audio control, so as not to interfere with control communications). In the case of production control staff, a complete bank of monitors is set in front of the control desk, showing the output of every camera, and of other sources (telecine, videotape, caption scanner, etc.). In the case of colour television, often only the transmission monitor is in colour, with the rest in monochrome. The art of the vision mixer or switcher has already been described (see Chapter 6 "Technical Operations"), but other technical personnel also need to preview picture output. It is also important for operational staff to be able to communicate with those on the studio floor, and in related areas, and for this reason a complete communications system is devised for every control area, which allows not only the producer to talk to floor manager, cameramen, etc., but also for the technical producer to talk independently to camera operators, camera control, telecine, videotape and the like (and similarly for the lighting director and his staff, or the audio operator and his staff). Cameramen, therefore, wear headphones with a different channel received in each earpiece, to accommodate both production and technical instructions and programme sound. Other technical areas may receive a combination of both sets, with talkback facilities, and in addition an internal telephonic system is also available for less routine contacts (for example with the videotape recording area, which does not monitor the whole production). Every service, indeed every studio, designs its own communication facilities, and further refinements can be made by patching (temporarily re-routing), to meet special circumstances. The technical supervisors will look after their own needs, but the producer should be careful (a) to specify any particular communication needs of his own, and (b) to remember that other important communications exist beyond his own instructions, which mean that he should confine his directions to the minimum necessary level, and not call too loudly or forcibly. He must also be careful to make his calls precise, and to be ready to repeat them; he cannot assume that all technical staff have necessarily heard everything that he has to say. Attention spans are inevitably divided.

The rehearsal begins with shot 1, and each shot is rehearsed in order.

While technical staff can be cued directly from the control room, this is not so in the case of performers. The floor manager therefore uses a series of visual signals, for basic cues—a downward movement of the hand cues the presenter to begin; a hand drawn across the throat ends his delivery; a quick circular movement of the hand asks him to speed up; a slow raising and lowering of the hand, in a wafting motion, asks him to slow down. (These signals are much the same as in filming, from which they were of course borrowed.) If other signals are required, for example during a scientific demonstration, they can be worked out in advance and agreed upon between all parties concerned.

As the rehearsal proceeds, difficult camera moves are explained and tried out, and amendments are made when it is clear that a particular sequence is not successful (all directors must be ready to improvise, even though their planning has been detailed). Constant adjustments are made to lighting, to camera placement, and to audio coverage. It is at once a team operation, and a series of independent functions—the producer or director is in over-all charge, but his helpers (especially technical staff) occupy themselves with technical refinements while still following his general instructions.

Thus a great deal depends upon the communication skills of the producer. If there are difficulties, he must be ready to advise: a sense of humour and patience are also essential. It is here that the producer's knowledge of the technical capacity of his equipment can prove invaluable, as he will know instinctively why delays occur, and when something which he has planned is simply not technically feasible.

Producers frequently ask how much they should control the production rehearsal from their seat in the control room or gallery, and how often they should descend to the studio floor. Again this is a subjective matter, but as far as possible, a director should try to control operations from his basic control position, using his monitors and his talkback facility to guide his instructions. This is after all how the control room layout was designed. Moreover, he has a floor manager in the studio, to act as intermediary and interpreter. On occasions, having said all this, it will still be necessary for the producer to communicate directly with his technical staff. In the case of a complex camera movement, for example, it may very well be easier for this to be discussed and demonstrated face to face; time can be saved by explaining technical problems and difficult moves in advance to camera crews, before rehearsal begins.

But in general discussions with camera and audio operators should be confined to the beginning, or to a short period of note-giving which comes at the end of particular rehearsal sequences.

Camera rehearsal is also a trying period for performers. They have been used to the personal help of a producer—suddenly they are on their own, working at a painfully slow pace through the production, with little artistic direction. In these early stages, they are inevitably working mainly for the benefit of the technical staff, and if they are wise, they will reserve their strength for later periods.

As the rehearsal proceeds, these early difficulties are obliterated. Each shot is attempted, and assimilated—subsequent rehearsals, or "run throughs", are more fluent and assured, and the shape of the whole programme gradually emerges. It is a process of crystallization which only experience can reveal, and to the external observer, the early moments of camera rehearsal appear chaotic. The producer must be patient and hold his ambitions in reserve; once basic moves have been understood, then he can concentrate on shaping and pacing the whole programme.

The members of the control room staff each have a copy of the camera script, and so the over-all intentions of the programme are, in theory at least, clear to them. This also applies to supervisory staff in the studio floor. But it is impossible for cameramen to carry and refer to a whole script, and therefore each cameraman has, clipped to his camera, a "camera card", which indicates in order the shots (and shot numbers) which he is to be called upon to execute. He knows that his camera is on the air from a light, which illuminates on the top of his camera when his shot is being taken; once this disappears, he is then free to move to the next location and to take up his next shot. So a characteristic camera card might begin as follows: camera 1: 1. MLS presenter; 3. MS presenter (move to position B); 7. CU display table; 9. MCS presenter.

The first rehearsal, where moves are fixed, is known as the "stagger through"; subsequent rehearsals, where the action is more or less continuous, are "run throughs". The aim of the rehearsal period is to move progressively to a degree of fluency where every member of the production team understands what is required of him, but the rehearsals have still not been so intensive that performers and technicians alike become stale. Ultimately, a "final run" approximates to a dress rehearsal in the theatre. It is followed by a brief line-up period (longer for colour) when final checks are made upon equipment; and then the recording.

Film sequences will be inserted as they occur in the script, but with only the cutting copy or working print used until the final run (or the run immediately previous). It is important that camera control and telecine operators see this print, since the grading of the show version may well differ from that of the cutting copy. Videotape will not normally be available, however, until the actual recording period, except when pre-recorded videotape inserts are to be used (which should be seen in advance of the recording, for the benefit of technical personnel—and also for performers and production team members, who need to have a sense of the over-all shape of the programme).

At various stages in the production, the producer will want to give notes to both technical staff and performers, but he should always speak with his team immediately prior to the recording (or prior to the meal break which often precedes the recording in more complex productions).

The aim of the producer should be, as rehearsals continue, to phase himself more and more out of the production. By the time of the final run, his interventions should be limited to basic cues, corrections of serious mistakes, and occasional encouragement. He is creating something which is ultimately a team effort; originally he had the only total view of the programme, but by the time of the recording, his vision must be shared by all the people concerned in the programme's realization.

After the programme

At the end of a programme, there is always an abrupt relaxation of tension, which has built up gradually over the rehearsal and recording period. No producer should forget to thank both technical staff and performers for the work they have done, and to give praise where due. He should also not forget to wait for a clearance from the videotape recording staff, assuring him that the recording is satisfactory, otherwise he may find himself faced with retakes, without all of his team present.

Whether or not a script assistant is available, accurate timings of programmes are needed, to assist with editing and to send to the continuity supervisor, so that he can schedule his day's transmissions. Some programmes may underrun slightly, and warning is needed, to procure additional caption material or announcements. For the sake of a disciplined service, no programme should be allowed to overrun, except in the most exceptional circumstances, and this obligation should be made very clear to all producers and support staff. If a programme is of excessive length, cuts must be made at the time of the final run-through; a service is not only judged by the accuracy of its schedules, but in the case of educational television, other educational activities have been planned on the assumption that scheduled timings will be invariable.

Recording and editing

Through advances in the video recording field, 90 per cent of television programmes are now recorded. There are two types of recording: (a) telerecording (film), or kinescoping and (b) videotape (see Chapter 5).

Telerecording does not give as good a quality as videotape, and editing has to take place after the film has been processed. When videotape recording (VTR) is available, therefore, the telerecording system is not used, but the latter is useful to transfer a finished production from VTR to film if it is difficult to transmit or distribute a programme in videotape format.

When telerecording is used film inserts in the programme should be recorded for timing purposes and the show print should then be edited in to the telerecording. This improves the quality of the film inserts in the final recording.

Videotape recording and editing

The type of videotape recorder used is of little consequence to the producer, but the types of facilities it supplies to some extent dictate the method used to produce his programme. They can include: a continuous recording; a stop, start recording which allows the producer to add on to a segment which has been recorded; recording vision without sound; recording sound without vision; inserting pre-recorded or studio production sequences into a section of a completed programme; freeze frame; reducing the speed of motion (slow motion); animation (frame by frame).

The above list includes some requirements that will have only limited use. Nevertheless, the only facility listed that requires a separate machine for professional standard use is for slow motion and frozen frame; all the others can be handled by one professional machine.

There are clear advantages to the educational television producer in many of these facilities, which allow for discontinuous recording. For example, when the recorder is put into the "assemble edit" mode, a programme can be built up in separate sequences, each butt-edited to the other; this helps the director in such areas as science or current affairs (where an interview with some noted individual can be arranged to suit his schedule).

Although this stop-start method of recording is simple and solves many of the producer's problems, it is not without its hazards. Each time the tape is stopped, ten additional minutes should be allowed in the production recording time. It is therefore necessary to estimate the time all editing will take during a production at the planning meeting, and discuss this with the technical producer.

When scheduling correctly for all technical processes (even for the simplest programme) double the programme length should be allowed for recording, and proportionately more for complex productions.

The final picture of the recorded segment and the first pictures of the next segment to be recorded must always be considered to avoid poor production techniques. An edit should not appear as a halt in a production, but as a continuous flow from one picture to another.

The assemble mode records vision, sound and the control track for each segment. (The control track is the guide line for the videotape machine for both record and replay, and without it the machine will not function.) To record on the insert mode (which allows sequences to be changed, or re-done) it is necessary to record the control track first; subsequently the editing is commenced, but this time the control track is not recorded. It is now possible to select the mode of "vision only" or "sound recording only"; since in some cases the sound has already been recorded and the picture is being added or inserted, or vice versa.

Some machines also have automatic editing. This is known as Editec (a trade name), which means that the producer can place an edit pulse on the control track. This pulse puts the machine into record or removes it from record; it therefore makes the edit perfectly accurate.

Pre-planned assemblies are part of a production, occurring during recording time and scheduled in advance. But it may be that editing will also have to be carried out after the recording period, to save personnel and machine time, as videotape facilities are normally in great demand. (This may happen especially when editing is unscheduled—when faults occur during the production, which have to be rectified.)

The process can be carried out in a

separate video editing channel, or in the general videotape area. Formerly, all editing was done physically, by actually splicing the tape, but unlike audio editing, this is a complex affair, occupying a good deal of time and demanding operational skill, and it is naturally costly, as videotape is expensive. It is far better to edit electronically, if necessary dubbing from one machine to another. The most sophisticated organizations now have forms of computer editing, which allow edits to be marked up on 1-in videotape machines, for electronic transfer on to the master 2-in programme tape, but such devices are well outside the scope of most educational television establishments. For those services which use smaller formats, especially 1-in, a far greater range of editing facilities is now available than hitherto.

Presentation

Presentation, the actual transmission of a programme within the broadcast schedule, does not usually affect the producer directly. The presentation process is carried out from a separate presentation area, or from master control; it involves the accurate cueing of many programme sources, on videotape and film, interspersed by captions, time checks, and sometimes on-camera continuity announcements.

In a live production, the technical producer is in touch with master control, and receives his cue from them. He then indicates to the programme producer when to open the programme, or to cue in the title film sequences, and once the programme is on the air, it is routed to master control, which handles the transmission, and fades it out at the end.

In educational television, time checks, a count-down, graphic indications of the programme to follow, etc., are necessary to allow the teacher in the classroom to know exactly when to complete his preparatory routine and to "fade up" the sound. In most services, a presentation routine is evolved, which is described in the teacher's booklets which accompany the programmes and which is explained and rehearsed on utilization courses. Characteristically, music is played between programmes (to allow for class seating, and movement), and a caption indicates the programme and series to follow. This may also be a useful time to make special announcements. One minute before the programme begins, a second hand sweeps round on a "school clock", giving an accurate countdown to the opening sequences. This ensures good communication between the production agency and its users and avoids placing too great a burden on the presentation and continuity personnel. In smaller services, it may be useful to record this initial routine on to the front of each programme, thus reducing the tasks which will be required of master control.

Part II

Producing for other media

Introduction

Even though a producer may be mainly concerned with television, he should know something of the fundamentals of radio production, and of producing for print and other audio-visual aids which are likely to be devised in association with his efforts Part II of this book therefore looks briefly at radio, and at print and audio-visual formats.

Before doing so, however, it will be useful to refer back to the network reproduced in Figure 1, pages 24-5).

First, it will be seen that the same overall phasing is reflected across all the media —phase 1 concerned with programme planning; phases 2 to 4 with programme preparation and assembly; and phase 5 with final production. In the case of radio, being a broadcast medium, many of the same essential processes occur as for television, with only visual elements removed.

With audio-visual and print media, there are some more basic differences. Here, aural and visual resources have also to be identified, planned and created, but their assembly is a technical process, often carried out in the laboratory over a period of time, not instantaneously (in a single recording session) as with the broadcast media. The process of creation is therefore at once more protracted and more deliberate; changes can be made to the final format relatively late in the production process, even (if necessary) after a finished product has been evaluated. Moreover, audio-visual materials cover a very wide range of formats, which may exist independently, or be combined in multi-media packages.

They are shown in the network according to their technical form (film, audiotape, print, videotape, etc.), but their creation may actually be much more co-ordinated than is inferred here.

One point should be strongly emphasized at the earliest stage. If we assume that all media are being produced within a coherent media system, with correlations and cross-referencing between materials, then the relationship between broadcast and physically distributed materials is crucial, since they are meant to converge at the point of utilization. In other words, the physically distributed products (books, notes filmstrips, tapes, etc.) which are to be used in the classroom or reception centre must be available at the time of the broadcast transmission. This means in turn that time must be allowed in the production network for them to be created far enough in advance to permit for their physical distribution (often, in large, poorly connected countries a time-consuming exercise). It is a requirement which often poses great problems to producers (especially to audio-visual and print producers, who often need decisions on the content of associated broadcast programmes much earlier than broadcast producers are inclined to commit themselves). Such a situation calls for sympathetic mutual understanding.

Chapter 9

Educational radio

Brian Kent
Frances Berrigan

In many respects the radio producer can be compared to the director of films, stage plays or television programmes. He interprets the words of others, and he adds the dimensions of radio scenery through his knowledge of his craft.

His skills include an ability to originate programme ideas and to devise programmes from basic ideas; to conduct interviews and record local sound; to research, write, adapt, record and edit material for broadcasting; to co-ordinate and direct talent (performers and speakers) and technical supporting staff; to select or commission and record music and sound effects; to brief writers, speakers and expert consultants and direct them either singly or as a discussion group; to select, guide and direct untrained talent (experts, children, teachers). Usually, too, the educational producer will assist in the preparation of support material (notes, diagrams, booklets).

The texture of sounds

Since radio deals only in sounds, the texture of these sounds is of paramount importance. Because some receivers may be poorly tuned, on the fringes of the reception area or in poor repair, all sounds must emanate from the studios as clearly as possible. Also, all sounds should be easily identifiable and distinguished one from the other as far as possible. Those sounds least under the producer's control are human voices.

Voices

Each voice used should be distinctly different to avoid confusing the listener. Voices are differentiated by sex, age, educational level, accent or dialect and character type.

Sex is the easiest to distinguish by sound alone, as the female voice is distinctly different from the mature male. But in early adolescence, occasionally—and unexpectedly—boys may sound like girls and at a younger age there may be no distinction at all. Children rarely make convincing actors and producers often have to use adults to take children's parts, usually adult women with light voices for both young girls and boys.

Age is less easy. And chronological age is no guide. The experienced producer can identify an approximate age in his actors by listening to them speak, but the less experienced may need to audition before casting; the voice with the incorrect age for the character may turn the programme into a farce.

In siung untrained talent in particular, the producer's ear must inform him. Actors will also provide some of the local accents needed, though some specialize and few can provide all accents. The accents or dialect of a performer, whether professional or untrained, must not be so broad that a listener has any difficulty in understanding (the difficulties of home reception combined with a strong accent may well make comprehension impossible).

Music

From the first days of radio, music has held an important place in general broadcasting, and it has also had a particular place in specialized radio productions, though its use has varied with changes of fashion.

Themes or signature tunes

Many programmes use a regular piece of music as an introduction. The music becomes closely associated with that particular programme, readily identifies it and gives warning that it is about to begin. The fashion varies and in some years the use of themes is more popular than in others. The mood of a theme is usually bright and attention-catching.

Musical introductions

Often music is used to establish a scene or mood before dialogue or action begins. If a scene is set in a particular country, this can be conveyed by using music of that country—bagpipes for Scotland; gamelin orchestral music for Indonesia; jazz for a 1920s setting, etc.

Bridges

A commonly used form of transition between scenes is the musical bridge which can establish mood or emotion, characterize and anticipate subsequent action. There is an infinite variety of specially composed short pieces for this purpose and publishers generally list the pieces in catalogues under various headings—busy, nostalgic, comic, tragic, etc.—to suggest the atmosphere. As a bridge between magazine items the music used is usually less descriptive in mood though a vocal may be used to illustrate a point.

Solo instruments

Certain solo instruments have particular associations—the flute suggests plaintiveness, wistfulness, nostalgia; the harp suggests rippling water; the banjo or concertina a rustic unsophistication; a piccolo and tuba together suggest comedy and humour. And they may be used for special effects. A harp glissando may introduce the "other world" godmother or good spirit, or when plucked may represent footsteps; a bass drum may better represent an approaching elephant.

Stabs and stings

Whole libraries of music have been specially written and recorded to provide "dramatic" stabs to highlight moments of high tension or to provide mood changes between scenes (i.e. fast-tempo to slow, night to day, sadness to happiness). On the other hand, specially selected pieces from orchestral, instrumental or vocal works are frequently used to establish an emotional attitude in the listener towards a scene or incident or a person.

To an increasing extent music is specially composed for individual programmes to assist in providing a heightened emotional response. Music so used is an international sound track—its language is universal.

Sound effects

The purpose of sound effects is to provide heightened reality, though they can also be used most effectively to provide a heightened sense of fantasy.

An actuality programme (i.e. a programme based on real life interviews and sequences) without effects would hardly be an actuality. And this is true of most radio programmes, features, documentaries, plays. Except for the deliberately arranged dramatic sounds—a pistol shot, a car crash, a breaking window—effects should not be obvious to the listener. They should merge into the pattern of sound, just as traffic noises merge into a city background.

The most common error in production is over-use of effects—overloud or overemphasized—to the point where subleties are lost and realism destroyed.

The most common error in writing is equally to produce a prose passage describing the effects, which reads like a page from a film *scénario* rather than a representation of sound required for a particular scene in radio. For example:

> The scene is a popular cafe at midday. It is crowded with workers and there are few tables available. There is a loud hum of conversation and the clatter of cutlery. Waitresses can be heard shouting orders to the kitchen: "Poached eggs on toast for two, with white tea", "Toasted raisin bread for one, with a glass of milk—and fill it up this time", "Steak and eggs—three times". A waitress drops a tray, with a resounding crash. There is a momentary silence. The conversation hum is heard again. Smithson sees Petersen across the room and calls out.
>
> *Smithson*: Ah there's Petersen, Petersen! Hey Petersen!

Any attempt to reproduce these sounds would result in an unintelligible babble of noise.

A producer, in editing, would ensure that the preceding speech set the location as a busy cafe at midday and replace the lengthy directions given above with—Effects: establish loud murmur of conversation with a background of cutlery clatter. Waitress (well off and voice pitched up): "Steak and eggs for three and three coffees—white." *Smithson* (off mike): "Ah there's Petersen [fade up] Petersen! Eh Petersen!"

The main effects in this scene (e.g. the murmur of the crowd), will be controlled best by the use of a crowd-effect recording, with the cutlery effects either "live" or recorded.

Most sound effects can be grouped into two categories—"atmospheric effects" or "spot effects". Atmospheric background sound effects are used to establish a location for dialogue—for instance the sound of a travelling car as heard from the interior could be used under a dialogue taking place in a car. Often such an atmospheric effect will be established at the beginning of the dialogue, faded under it either to be maintained at a very low level or faded out altogether, and then faded up gradually towards the end of the scene to remind listeners of the present location and possibly prepare for a cross-fade to the next scene.

Spot effects

Gunshots, crashes, clanging doors, jingling chains, whistles and footsteps are used to add significantly to the action and are often arranged live in the studio as hand effects.

Some effects, such as a horse and buggy, aeroplane take-offs, tyre skids, a tree falling, thunder and rain, are more realistically portrayed and controlled by using recordings, either on tape or gramophone record. Special effects may have to be obtained by taping before the production, though a creative effects officer or producer can make up "hand" effects by the most unlikely means. A sheet of cellophane (from a cigarette packet) crinkled close to the microphone makes an excellent fire. Marching soldiers are really a dozen or so small wooden blocks, about an inch square, each suspended by pieces of string of the same length, connected to a 12-in square block. The small blocks are repeatedly dropped rhythmically on a table near the microphone.

Most effects have to be identified by giving a clue in the dialogue. Pouring rain can be mistaken for an express train in a tunnel; striking a match near the microphone will only confuse the listener unless identified.

Loudness in radio is relative. An impression of a tremendous explosion appears this way by contrast to the sounds immediately preceding it (e.g. the actors whispering very close to the mike). The important point is always that the end result—the sound heard from the receiver, not the means to achieve it—is what must concern the producer.

Fades

Sounds feeding into a microphone can be reduced in volume in several ways and with several effects.

To fade under. Turning of the volume control (the fader) to reduce the sound level of music, voice or effects, allows the commentator or announcer to speak and be heard "over the top" of these sounds. The fader can be completely closed or held under at a constant level to be raised to normal level as required.

Cross fade. As one mike is faded down a second is faded up. It simplifies crossing from one broadcast point to another when continuous broadcasting is taking place at both points. It can be used to cross between scenes in a dramatic presentation, when mikes with different acoustic characteristics are used.

Mike fade. To close the fader slowly to that point when no sound can be heard tells the listeners that the scene and its actors have been removed, physically as it were, from their immediate attention and they await the introduction of the next scene.

Live or body fade. If an actor is directed to walk slowly from the mike without the fader being altered, the listeners know that he is leaving the scene (to which, however, they are still paying attention).

Board or master fade. When the master fader is closed, all mikes and other sound sources are also closed off by the use of this one fader, including recorded effects, taped inserts and live studio output.

Effects fade. As implied, the sound effects fader is turned down. That is usually meant to indicate the close of the scene.

Reverberation

Studios may give a "dead" or "alive" effect depending on their acoustical characteristics. If part of the sound emanating from within the studio, voices, effects or music, enters the microphone and the balance is absorbed within the studio, this is a "dead" effect; if part rebounds from the walls to be picked up again by the microphone, this is a "live" effect. The producer has some control over the degree of these studio resonances and they therefore become part of his production technique.

It should be noted that a broadcast in the open air gives the dead studio effect mentioned previously, because there is no bounce back or reflection of the sound.

The announcer reading the news needs a dead studio. The listener is interested in the news items and is not concerned with any pattern of sounds other than that offered by his voice. The imagination does not need further stimulation by additional sound—the news is enough. But a scene from a play set in the living room of a home needs something in addition to voices It must sound as though it is in a living room, and the voices of the characters need a life and a richness which helps to tell something about them. This can be achieved in part by a live studio, one with some degree of reverberation.

A live studio, one with walls built of a material with a degree of reflectiveness, can be converted to a dead studio by covering the walls with soft drapes which will absorb the sound and not reflect it. A studio can be made more alive by placing screens with varying degrees of reflectiveness in different positions relative to the microphone. The basic principle is that liveness can be varied by altering the time taken for the original sound to reach a reflecting object in the studio, bounce back and pass again through the microphone. In a very live studio, the sound will pass through the microphone several times—though the time interval will be measured in milliseconds—technically called reverberation time. Reverberation will be increased if the sound is reflected from several screens placed at different distances from the microphone. The reflected sound from each will reach the mike at different times.

These different degrees of reverberation may help give the impression of different locations, e.g. rooms, halls, cathedrals. Too much reverberation may make comprehension difficult.

If the time taken for the sound to pass through the microphone again is long enough, this will be heard as an echo. The echo effect is useful to the producer but is difficult to achieve without technical assistance, because reverberation time in most studios is too short. However, many studio complexes have an echo chamber into which sound can be fed, or a system of artificially delayed reverberation, to give echo effects of varying intensity or duration.

Quite often reverberation will be added in recording music or singers to give more "presence".

Microphone technique

The microphone acts like the human ear. Placed in front of a choir at face level, for instance, it will pick up, most clearly, the voices closest to it. However, unlike the human ear it will not discriminate between sounds. We consciously ignore, or at least push into the background, the sounds we do not want to hear and we concentrate on the sounds in which we are interested. The mike will not do this; it will pick up all sounds within its range, therefore the producer must channel off the unwanted sounds.

When discussing reverberation, mention was made of screens used to vary the degree of reflection of sound waves; the same type of screens may be used to direct the sound waves towards the target mike and away from other mikes. This channelling will help in part to overcome the disadvantages of the omni-pickup characteristics of the mike. Intelligent use of particular mike patterns will offer greater help. In discussing music programmes, it was suggested that several groups (singers, musicians) using different mikes but performing at the same time, could create the problem of blurred sounds because all the mikes will be capable of picking up some portion of all the sounds created in the studio.

Using mikes such as cardioids (see Part I, Chapter 6), with the dead side towards the unwanted sounds and using shields to help counter "sound leakages", will go a long way to provide the required result. The pattern of the cardioid will also give equal coverage to each of a group of broadcasters at the one microphone. For instance, if the mike is held high on an extension stand and tilted down, it will pick up an equal value of sound from each voice in a choir.

As illustrated in Figure 49 a narrator, a group of singers, and a musical *ensemble* can all operate effectively within the one studio at the same time, by the use of microphones with a cardioid or similar pattern. To control this situation on air requires a degree of pre-planning. During rehearsals, the volume-control setting required to reach zero decibels on the sound-measuring meter, for each group of performers, must be checked separately on each mike. These will be the individual settings required during the broadcast. However, when both groups are performing at the same time, it should be noted that the volume-control setting for each must be lower in order to maintain zero decibels. This is because it is impossible, despite the use of screens and special mike patterns, to prevent some part of most of the sounds in the studio entering every open mike.

Total sound control of the studio output will be by means of the master volume control. During the broadcast, constant monitoring will be necessary both to achieve a balance between all groups and prevent overloading of the decibel meters which would cause distortion. Careful noting of the various meter readings during rehearsal will make the final broadcast more acceptable as a radio production, and much easier to accomplish.

Mention has been made of the various effects possible through fades. Now a further step can be taken. All sounds should peak at about zero level on the meter, and therefore will be received by listeners at equal degrees of volume or loudness. However, sometimes the producer tries to give an impression of different degrees of noise level. By moving an actor back from the mike and directing him to turn slightly away (if he faced the mike, his voice would direct air waves against the mike as well as sound waves), he can actually shout and sound as though he is shouting, even though the sound heard is no louder in volume than ordinary speech. Similarly by placing the actor very close to the mike and directing him to drop his voice to a whisper, that is the effect that will be

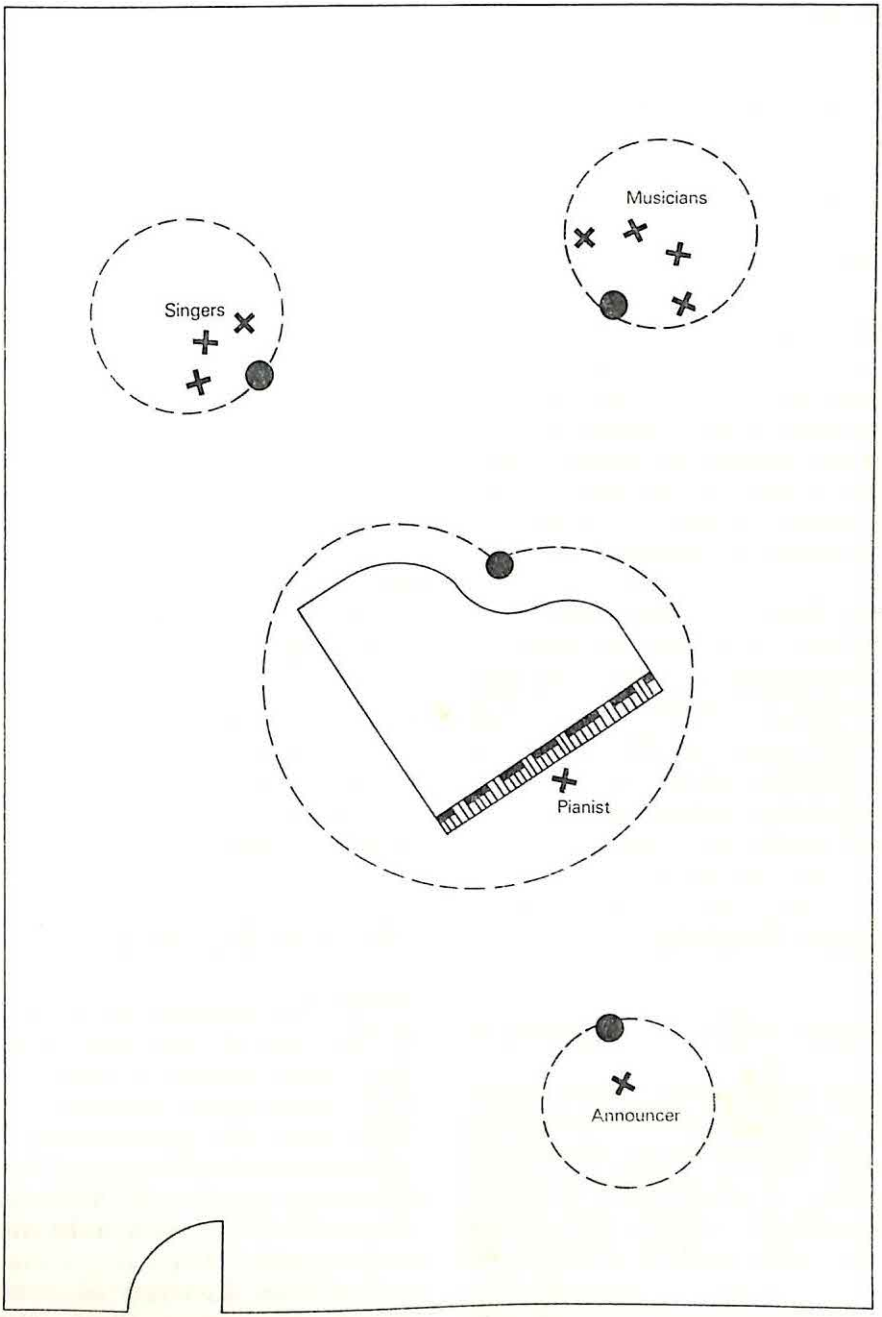


FIG. 49. *Layout for music recording.*

achieved—a whisper, but in fact no greater difference in volume is received than a shout.

Though the sounds produced cannot always represent faithfully those sounds of real life, the producer can give impressions which have the same effect. This was mentioned in relation to loudness and softness. To represent the voices from the "other world", or the subconscious, or memory, many producers use a filtered mike. This has the effect of removing the low or high frequencies from the reproduced human voice. A simple example is when both low and high frequencies are removed to achieve a telephone effect. In this case the sounds heard are those sounds which a telephone (a poor quality mike) is capable of reproducing.

The voice from the "other world" will sound more ethereal if only the higher register of frequencies is heard. Try only the lower frequencies together with a high degree of reverberation and the voice speaking slowly off-mike, to help the imagination picture a giant of a man, as tall as a tree and as broad as a door.

Programme formats

The straight talk

This was one of the earliest uses of broadcasting and is used mainly to allow a speaker with a special "message" to be heard by an infinite number of people, instead of the necessarily limited number who would normally be within hearing range of his voice.

But for the speaker who is a broadcaster, there are difficulties; he cannot be seen by his audience and he cannot see if he is losing their attention, or if they understand him. So he must remember certain facts about the listeners. They will be listening either individually or in small groups; any visual or auditory distractions near the radio receiver will compete for their attention; if he speaks too fast, or without expression, or uses long sentences or difficult words or abstract ideas, he will lose them. He must remember that the spoken word is conversational; it is written to be heard and understood immediately, not to be read and digested at leisure. The audience is listening, or should be, to a friendly interesting person who is close by, almost in the room speaking directly to them.

The salient points in writing a broadcast talk are therefore short sentences, simple words, one idea at a time, a limit to the number of ideas in any one script and "rest" points between ideas so that the listener may catch his breath. The talk should be divided into three- or four-minute segments each covering one idea, enlivened with humour and with examples the audience will understand.

The actuality programme

As the name suggests the material consists in the main of interviews, sounds, statements, conversations of people in a home/work environment, expressing views and ideas about the subject being broadcast. This content must be gathered with a broad programme structure in mind, the detailed construction being made in the editing room and continuity studio.

A detailed discussion of recording and editing techniques is given later in this chapter.

Documentaries

Here again the name suggests the content of this type of broadcast. It is drawn from documentary sources: texts, speeches, newspapers and books. Actors are often employed to simulate the voices of those originating the documents, either as straight reading or as dialogue. Research is of first importance and is carried out by the producer or writer, perhaps with the help of a specially engaged consultant. The compilation of a documentary requires skill in selection of material, a fine sense of programme balance, and ability to direct the actors who will be helping to interpret, as accurately as possible, the original thoughts of the authors of the documents. Continuity writing for explanation and linking tends to be easier than in actualities, because the content of the programme is more easily controlled and selected.

Features

Feature presentation is a dramatization of either an actuality or a documentary style of programme, or more usually a combination of both. It is a creative treatment of people or people's lives performed by actors. It allows balance to be achieved more readily and a more dramatic portrayal with a greater impact on the listener. It gives greater freedom and flexibility to both writer and producer, but also offers greater temptation for licence and therefore false representation. Any actuality scene is written as it would sound if recorded in the work/environment situation and is used if the recording cannot be obtained, or if obtained, could not be used because of technical or other reasons. Features are a popular form of broadcast for writers, producers, actors and the audience, because each allows a good margin for creativity within a framework of a set subject, unlike fictional drama which will be discussed next.

The dramatization

This can range from a radio play or pure fiction to a specially written story which through creative fiction depicts the life and time of a particular society. This form of broadcast relies upon the skill of the radio writer. The straight play is usually the entire creation of the writer and if well written, will require only minor editing before production. Other forms of dramatic radio presentation may be the result of special commissioning of a writer by the producer. The briefing will state the aim of the programme and perhaps a broad story treatment, and may include the time setting and an outline of the main characters.

The writer usually provides a detailed story treatment for the producer's approval and subsequent rough drafts and a final script. As the commissioner of the script, the producer plays a large part in the final outcome.

Discussion programmes

Such programmes may be a discussion between (a) several persons in the studio; (b) several persons, each at remote points from the studio, with their contributions being fed through the studio; and (c) a combination of both (a) and (b).

In each case a chairman will be required. His duties are that of every chairman—to see that each person has a fair opportunity to present a case, to keep the speakers to the subject under discussion, and to maintain time limits for each speaker. Unless the chairman is a professional broadcaster, the producer should take this role. This has the advantage of full control over the contents of the broadcasts, a closer empathy between producer and other participants and an ability to change the direction of the discussion even after the broadcast has commenced. There are disadvantages; the producer, being directly involved as a participant, may lose some objectivity or may fail to recognize flaws in the broadcast, through lacking over-all control of the production. The disadvantages can be reduced if another staff member can monitor the programme from within the control booth.

The chairman must introduce speakers and should be aware that there is a continuing need for clear identification of speakers throughout the discussion. This can quite easily be done by referring to them periodically by name. Where a discussion becomes rambling, the chairman can assist the listeners' comprehension of points made, by briefly summarizing the position of the argument, and he may sum up the issues raised and opinions expressed to round-off the programme.

The simplest programme to assemble and control is (a) above. Briefing is simple. The nature of the items to be discussed, some idea of the type of people involved in the discussion and their ideas can be known to all participants and time control will be more effective. Types (b) and (c), above, present greater problems though some advantages. Briefing is more difficult, those broadcasting from remote points cannot be seen and their attitudes and ideas may not be known. However, greater mobility is obtained (i.e. a wider range of people will be available for the discussion). If other producers can be involved at the remote points and are well briefed, most of the disadvantages can be eliminated.

Magazine programmes

In the simplest form, these programmes are straight talks using three or four speakers, each contributing a separate item on the same subject or theme and broadcasting from a studio.

The more usual form is closer to the actuality technique—recordings in the field, statements recorded off a telephone, readings of written comment, usually but not necessarily around a common topic. All recorded material is edited and timed, music selected, continuity written and the final programme timed in rehearsal and recorded for later on-air use or broadcast direct.

This type of programme is valuable and popular. It can be constructed easily and rapidly, is inexpensive, and can bring selected views readily to a very large number of people. With the use of telephone recorders, the main content of a magazine programme can be recorded within hours of receiving a brief, so using radio's advantage of immediacy.

Music

Music programmes offer their own special problems and rewards. Quality of sound is more important than in any other programme area, and if choral work is involved, clarity of words is of first priority; especially in education programmes.

The special problems relate to the "balancing" of the programme. The full tone and richness of each musical instrument and voice must be developed in full but without submerging any other instrument or voice. To "balance" each correctly against the other is the task of the producer. The difficulty is increased because the full extent of the overtones of musical instruments can only be achieved through a relatively long reverberation time, and the problems of reverberation have been discussed elsewhere.

Though we can say we need a larger studio for music (to provide longer reverberation time), the characteristics of each studio are different and how they can be best used for music is really a matter of experiment. But some broad principles can be stated. Always use a microphone with the widest range of frequencies, use a separate microphone for singers and musicians, space them as widely apart as the physical dimensions of the studio will permit and provide a separate microphone, to be used as required, for solo passages by instruments. Invariably when singers and instrumentalists are performing at the same time on separate mikes, some of the sounds each makes will be picked up on all mikes. A degree of this is acceptable, but too much will cause a blurred sound.

The final result can only be judged by the producer—his ear has to represent that of the audience, what he hears is what they will hear. There is no measuring instrument to tell the producer that the balance of instruments and voices is correct; he must do this by the keenness of his hearing.

Script writing and editing

Whatever the form of programme presentation, if there is to be a written script, the producer will be involved in briefing, advising, editing and probably rewriting. Editing and rewriting will demand of him a strong creative effort and wide knowledge of radio techniques.

The opening

The first moments of a radio programme are vital. If the audience is not held in those moments, it may be lost for the remainder of the programme.

Balance

Effective listening to spoken-word programmes demands a concentration of attention greater than in any other media. Each span of concentration should be limited to perhaps five minutes (and rather less for children), before a break or mental breathing space is provided. This break can be as simple as a scene change bringing in new voices and a new tempo, or the use of music. In a programme for children no more than four or five such periods of concentration can be presented in any one programme. Adults obviously will accept more, but every audience, irrespective of age, education or experience, has a limited period of concentration. The most effective means of providing the mental break is to give a contrast of sound, following a scene full of tension with one that is relaxed and light in mood, or following with a slow pace after a fast tempo of action or speech.

Transitions

Because radio presents sounds alone, unskilled scene changes may leave the listener floundering between these scenes; at all times he must stay with the action of the script.

Each scene must lead by sound of some

kind to the next (not forgetting that silence is a "sound" in radio). Continuity writing provides this by linking the scenes in magazine, actuality, or documentary programmes, usually with words but sometimes with music or sound effects. Transitions in dramatic writing require more skill by both writer and producer. The ending of one scene should lead naturally to the beginning of the next and usually the cue is given in an actor's words, by inferring the place and time of the following scene. This change of scene can be supported and emphasized by a change of sound provided through different voices or different pace or even a different acoustic; for example:

Smithson (Open air acoustic, traffic background: Petersen—you ought to see the specialist. You shouldn't have any difficulty in making an appointment. Go on man—see him tomorrow ... (fade voice and effects) see him tomorrow. (Pause).
Petersen (Room acoustic): Excuse me, please.
Nurse: Yes, can I help you?
Petersen: My name is Petersen.
Nurse: Oh yes Mr Petersen, Doctor is ready, please go straight in.

Or again:

Smithson: I wonder what Petersen is up to now? (Pause. FX Fade in cafe effects, hold under for...).
Petersen: Two coffees please.

Studio production

Rehearsal

Productions using actors or readers (that is, drama, features or documentaries) need up to three hours of rehearsal for a twenty- or thirty-minute on-air programme, including at least one read-through and two on-mike rehearsals. During the read-through all participants should mark their parts and cues, and the producer should help them establish their character parts in broad outline. Experienced producers do not direct character parts in too much detail. Whatever the producer's view of the character to be played, an actor if given the opportunity for a personal interpretation may provide a finer version.

The first on-mike rehearsal can be used for timing, to allow the actors to "feel" their parts, to ensure that transitions are "working", to check on cues, effects and music and tape inserts. A discussion after the first rehearsal may be used to correct inflections and pronunciations, to establish pauses, cues and transitions and allow development of character interpretation. It is in this post-rehearsal discussion that a decision must be made to allow or remove optional cuts. The second rehearsal will allow a check that corrections have been made, timing is accurate and that over-all balance is acceptable.

There is sometimes a tendency in a long and difficult production for the performers to develop, during rehearsal, a constant pace or rhythm, when variation, especially between scenes, is the aim. This may be broken by rehearsing scenes out of sequence. Some scenes are always more difficult than others—these are the ones to rehearse separately and so provide the necessary break. A five-minute period of relaxation for all the team before the actual broadcast or recording commences will bring a fresh vitality to the over-all production.

Script preparation

All sounds that are to be realized in the studio should be scripted (for example, continuity for magazine or actuality programmes; reading and acting parts in features and documentaries; tape inserts, marked with tape numbers and opening and closing words and with timings; music and effects, correctly identified).

All members of the studio team (i.e. actors, speakers and technical personnel) should have scripts before rehearsals commence, each marked with the roles to be played. The cast in radio productions are not required to learn their lines as they must for television, film or the stage. Therefore scripts are a usual part of their equipment even during a broadcast. It is important that the scripts be set out to be easily read or altered. They should be typed or stencilled in double spacing on heavy weight paper. Duplication paper is excellent; it is heavy enough to maintain sufficient stiffness for reading at the mike without rustling.

Before rehearsal, mark all optional cuts and cues, and prepare fresh transitions if optional cuts include parts of preceding or succeeding scenes. Establish (by stop watch) accurate timings by reading through the script and adding the length of tape inserts.

Presentation

Discussion has centred around types of programmes and the means to produce these programmes. It is assumed that the producer is a leader of a team, which includes a technical operator. But there will be occasions when a producer may be required to work without any production assistance. His concern then, over and above the production requirements already discussed, will be the presentation of the material making up the programme. The programme may consist of pre-recorded tapes, music inserts on tape or disc, announcements and continuity to be presented live by the producer, and speakers in the studio or fed-in from remote points.

Each item will require balancing against all other items, which means that as each is transmitted, the sound level must be adjusted to provide peaking at about zero decibels. Levels of pre-recorded items, live continuity, and announcements and talk from the studio, can be set during a pre-broadcast run-through and noted on the script or continuity sheet. Material being fed in direct during the broadcast will have to be adjusted "on-air". The producer requires manual dexterity, a cool head and much practice.

Immediately before going on air, the producer will be seated at the announcer's desk. Within reach will be two or three turntables, a bank of tape replay machines and controls for all microphones. Each turntable, tape replay and microphone will have its individual on-off switch and fader control. Controlling total sound output will be a master fader.

Within the first few moments of commencing the programme, the producer may have carried out the following: switched on his microphone and made his announcement, switched on a turntable, faded in theme music, cross faded to an effects recording, then to a tape recording and, at the end of this tape, opened his own microphone again to introduce a speaker in the studio—in every case remembering to operate each off-on switch and each fader.

For smooth presentation, the producer must check such levels as he can before commencing broadcasting—but live speakers from the studio or remote broadcast points will not always give the same balance in performance as in rehearsal. Therefore, constant monitoring of levels is essential. It will not always be sufficient simply to lift the levels if live performance volume is below that obtained in rehearsal. This may result in distortion.

Actuality recording and editing

Recording

The experienced radio producer records interviews, insert material for magazine programmes and segments for feature and documentary programmes with an ear to the editing process which follows. Even where the physical task of editing tape is not the responsibility of the producer, the more he knows about the process the better, since decisions as to what to cut of the original material, and where to cut it, are entirely in his hands.

Editing tape has two important aspects. There is first the technical competence which ensures that the finished version does not sound false (in other words, that the cuts do not interfere with the speech pattern of the person recorded). Second, there is the creative aspect of editing, which is mainly a matter of judgement on the part of the producer. "Good" editing can transform a protracted repetitive tape into a lively and interesting interview if the producer is able to filter out the salient points, and remove unnecessary slurs and pauses. By clever juxtaposition of interview or recorded comments, by varying the pace and length of the tape inserts, the producer can add life to his material, can highlight points, can weave the interviews he has gathered into a logical argument. While the first aspect of editing, the technical process, can be carried out by anyone trained to dub from one recorder to another, or to use a pair of scissors and a chinagraph pencil, the technique of creative editing is a part of the production process and can only be mastered by someone who understands the content of the material with which he is working.

It is therefore not an exaggeration to say that, even before an interview is recorded, the producer knows how he would like it to sound for the purposes of his programme. Once the tape has been recorded, editing is carried out to refine the material so that it is more suitable for his purposes. A common misunderstanding of the editing process is that it is, as often as not, an attempt on the part of the broadcaster to distort the material he has gathered, but while this is possible, editing is more often undertaken for much more practical reasons. In the first place, tapes are edited for length. One of the reasons why the producer should understand what is involved in the editing process is so that he can appreciate the amount of time it occupies; with this knowledge, he can avoid the indulgence of over-recording. If what is required is a three-minute interview for a news magazine, then the reporter or producer should attempt to limit his interview to about five minutes or even less, as editing time can be costly or difficult to arrange where facilities are heavily used. Another consideration is the expectations of the interviewee. Contributors who have been subjected to a nerve-wracking half-hour in front of a microphone are often annoyed to hear the mere two minutes which is their "on air" allocation. The interviewer should inform his subjects that a certain amount of time is allowed for their contributions, and should ask them to limit their comments accordingly. Not all the onus is on the subject, however, and it is up to the interviewer to ask short, simple questions which can be answered in the time available, and even to cut in where the interview is tending to become drawn out.

Formulating questions before an interview is also in its way a part of the editing process. The producer decides beforehand what it is he wants to know, and begins his recording when the relevant points are being discussed. It is, of course, understandable that many people will want to provide background material or to go over old ground to refresh their memories before dealing with the questions the reporter has in mind. The choices here are to record all the material, making a mental note of where the relevant sections of the subject begin and end, or to cover the extra material in a pre-interview, warm-up session. If necessary, the interviewer can make a few notes during this time if he feels that the information may be useful. The latter solution is preferable, provided that the interviewee agrees.

Decisions about the structure of the interview and its placing are particularly important if the item is to be part of a feature, where a number of points of view on a particular subject are to be woven together. Basically, the more precise the comments contained in each interview, and the less irrelevant the materials which the tapes contain, the smoother and easier will the editing process be. It follows that the producer should appreciate very clearly the reason why he is making each recording, the approximate length of each item within the final assembly and the over-all style and shape of the programme.

Editing will be less complicated when tape interviews are of comparable technical quality. Differences in background noise and acoustic add to production and editing problems (although they can be used to effect where the producer is aware of their existence and wishes to use the effects to suggest variations in location). If there are noticeable background changes from one interview to another, they will have to be explained somewhere in the linking script, and therefore, except when such transitions make a specific point, the tapes should be recorded in similar situations. Tapes which have even slight traffic noise can be hard to cut, although an experienced editor can usually cope. Interviews recorded in a room with a radio playing or next to a class are almost impossible to edit. However, when background noise is inevitable, begin the interview by fading up the background —then fade it down—and end the interview by doing the same in reverse. This establishes the location (but also record some extra "wild tracks" for good measure).

The best way to ensure comparable quality is therefore to avoid background noises; to make sure that acoustic arrangements are not too greatly at variance; to use the same recorder and microphone for each interview, and to match the level of the speakers by pre-testing before the interview begins. This last point is extremely important, especially if the voice of the reporter is to be used in the final programme. It is relatively easy to make sure that all interviewees are recorded at the same level on the tape machine, but where there is a variation in pitch, depth and tone from one subject to another, levels will have to be altered. At the same time, the voice of the reporter has to be matched to previous recording as well as being matched to each speaker. The solution is for the interviewer to set his voice in relation to a particular distance from the microphone, so that the level is set on the first interview. With subsequent interviews for the same programme, the interviewee with the soft voice is placed nearer to the microphone, and the interviewee with the loud voice is placed farther away. Of course, people can be asked to speak more loudly or more quietly, but the likelihood is that this will be forgotten in the course of taping. It is better to rely on the professional to make technical adaptations.

The technique described above is suitable where there is a fixed microphone, but it can also be used with a hand-held mike, and an alternative when using portable equipment is for the reporter to move the microphone during the interview. This usually means that he tests levels before the interview begins, setting the distances from one person to another. In practice this entails finding one position for the interviewer, and moving the microphone closer to the interviewee when he replies to questions. There are snags, in that it is difficult to interject, and may mean that the beginnings of some replies are recorded at a lower level if the interviewee interrupts the questioner. Despite these problems, the technique is preferred by some professionals and may be necessary if one speaker is unable to project his voice adequately.

Although editing can do a great deal to help reduce mistakes in recording, it cannot turn poor quality material into compulsive listening. Tapes which are virtually inaudible, or which sound as though they were recorded in a bathroom, or which are punctuated by background noise, cannot be salvaged. Similarly, interviews in which the speaker rarely reaches the point, rambles excessively or has a pronounced stutter will require so much editing time that it may be advisable to begin again with another subject.

Editing

The first stage in the process of editing tapes is to listen to them. The producer decides which parts of the interview he needs and makes notes, bearing in mind the content of other items which he intends to include. In some countries, it is still possible for producers to obtain typed transcripts (and in this case, he passes the recordings to a typist to prepare). Even so, once the transcripts are ready, he listens to the material and marks on each sheet the sections he wishes to retain; he must listen to the material before passing it on for editing to make sure that the sections he chooses sound sensible. What may make sense on paper will not necessarily add up to an acceptable recording. He has to watch for inflections, for breath pauses, for sections where the level may be lower or where there is distortion. There may be gaps which will have to be edited out and which can only be heard, not seen on the printed page. He may decide to include a seemingly irrelevant phrase because it adds life, or humour, or gives the listener time to catch up with the speaker and the content. He may find that what appears on the printed page as "confused—two people speaking" is impossible to cut out because of what comes before and after, but he may also find that this section adds an element of controversy or interest.

Where the producer is fortunate enough to have a transcript of the material, he can almost certainly hand the tapes to a technician for editing. If this is the case, the marked-up, printed version showing which sections to delete (and the order in which the sections are to be banded on the spool) is passed to a technician, who is then best left to edit them alone. There is still good reason for taking time to point out problem areas to the technician or junior producer before editing begins, so that queries can be answered in advance; and it is always a good idea to listen again to the tapes when first stage editing has been done, both to check timings and to make final adjustments. This last stage should always be carried out by producer and editor together.

Where the work is being carried out by a skilled technician, it matters little to the producer whether the technique used is to dub the relevant portions on to a new tape in the order in which they are needed, or physically to cut the tape. Many technicians prefer to "dub-edit", partly because there is less tape wastage and partly because they believe that the end product is preferable, especially in the case of music recordings. However, more and more, broadcasting companies are turning to the pattern where the producer edits his own material. The technical process used then is to cut the tape, throwing aside the smaller sections of unwanted material, winding longer sections on to a separate spool. Producers working in this environment manage without a transcript of the interviews and the equipment needed is reduced to a tape recorder with an editing block, a yellow or white wax marking pencil, leader tape, scissors or blade and adhesive editing tape.

Again, the first stage in this process is to listen to the tapes. As there is no printed version of the content, the producer has to rely on memory; he listens to each interview several times, in order to build up or confirm an over-all picture of what he has recorded. As each interview is heard, the producer makes notes of the content. At the end of his first listening session, he has jotted down the salient points, and has some idea about repetitions, key points, definite inclusions and definite omissions. A second hearing should provide him with enough information to work out a basic framework and a logical order for the sections he wants to include and he may even have been able to note the "in" and "out" cues for particular passages (this means that he writes down the first phrase he wishes to include, and the phrase with which he wishes each section to end, and goes through all the tapes in the same way; but this may have to wait for a third hearing, where there is a great deal of material).

Physical cutting is the next stage. Most standard tape recorders can be adapted for this form of editing, except the small portable varieties. What is needed is for the replay head to be exposed, so that the exact portion of tape where a word or breath begins and ends can be seen as well as heard, and can be marked with the marking pencil. Those machines which have a "pause" button, allowing the spools to be moved manually back and forwards across the head are preferable. When the first word of the required phrase is found, it is marked with wax pencil; the tape is then pulled out and placed on the "editing block" and cut with the blade exactly on the marking. The beginning of the section required is joined with adhesive tape to a red or yellow "leader" tape, and placed on another spool. The tape is then listened to again, until the end of the required section is reached, when the marker is again used, leader is added, and the "master" is put aside until the next section needed is reached. Unwanted material, where it is short, can be spooled off into the waste bin. Where there are lengthy sections of material recorded but not to be included, these can be retained on the original spool and eventually passed to the erase room.

It is preferable and quicker to complete this first stage to arrive at a master tape containing likely usable segments in the order in which they were selected. Afterwards, it is a simple process to listen to the master, draw up a final plan or running order, delete some sections which are of inferior quality, repetitious or time-consuming, and then to reorganize the sections in final order on to another spool. Whatever happens, there are nearly always phrases, coughs or pauses to be fine-edited, even after the linking script has been prepared; such fine-editing is always best left to the end.

Chapter 10

Audio-visual and print media

George Klein
Josephine Hickey

This chapter deals with audio-visual and print, but only in a limited capacity: as supporting items within a system which is principally concerned with educational mass media.

Functions of support media

The main functions in this context are:

To provide explanatory materials for teachers, telling them how to prepare for and follow up broadcast programmes, how to obtain the best results in their teaching, and how to integrate them with their classroom scheme of work.

To provide supplementary materials (such as illustrated pamphlets) for pupils, which can be read and referred to before and after the programmes, and which can contain proposals for follow-up activities, ranging from topic suggestions to detailed work sheets.

To provide additional class or group materials for occasional, unscheduled use (e.g. films, records, posters), intended either as an extension of work begun in the broadcasts, or as a vehicle for teachers to individualize their work. This kind of use can range from general productions (e.g. films) which illustrate in greater depth a topic already sketched, to complete units (e.g. cassettes, slide sets), which can be used by the teacher as a base for remedial work (in areas where children are weak) or advanced work (where a class is in advance of the average programme level). In this way, the broadcast programmes can be adjusted more specifically to local levels of performance, and to the teacher's own ideas and preferences, thus giving the highly motivated teacher a better chance of imprinting his own stamp on the subject.

The main purpose of including audio-visual media in the mass-media system (apart from the relevance of particular media such as slides or films in specific situations) is therefore one of flexibility—they help free the apparent rigidity of the broadcasting approach. But it must be remembered that this is not the only function of audio-visual media; in fact, it is neither their traditional function, nor their most important role. Audio-visual aids have been used apart from broadcasting for a very long time, as adjuncts to classroom teaching or to adult learning, outside of any instructional system beyond those of the teacher's own devising. And of course, print media are the most traditional of all formats, in the form of text books, though they have been recently diversified by the development of topic books, class packs, and various smaller, looseleaf or packaged combinations of materials.

So in considering the role of audio-visual media in relation to broadcasting, we must continue to bear in mind their origins. It is unlikely that a separate system of audio-visual production and distribution will be devised to handle the mass-media component, indeed it would be uneconomical to consider doing so. It is far more likely that, in some way, the traditional functions of audio-visual media will be linked with, even subsumed by, the new mass-media production structure, and the degree of satisfaction of their performance will depend upon the way in which this assimilation takes place.

What is the over-all range of functions for an audio-visual service? It will include: (a) the production of audio-visual and print materials in prototype and in bulk; (b) the distribution of materials (both specially created and externally purchased); (c) training in equipment use and maintenance; (d) training in production techniques, especially for low-cost media to be used in local resource centres; (e) the evaluation of equipment and materials produced externally, and making recommendations on their selection and purchase; (f) the distribution of equipment and loan materials, either to individual users or as part of a library system.

Obviously this list of functions includes a number of tasks which are not directly part of the mass-media system. Yet these functions are still important, particularly if an integrated over-all system for the use of media is proposed, and they should be remembered, even when the discussion is concentrated, as here, upon (a) above. In what follows, therefore, a brief account will be given of the forms of audio-visual production, to familiarize the mass-media producer with their use, but the processes by which materials are conceived, planned, scripted and executed do not differ materially from those described earlier. The audio-visual producer *per se* is referred to in many other books on this discipline: the present account seeks only to introduce the field.

Audio-visual materials

We are not concerned here with the production of charts, posters, transparencies, etc., which can be undertaken at the local level, in teacher resource centres; our concern is rather with items which, because of their complexity, sophistication or widespread utility, are prototyped and produced at national or regional level. This range includes films, videotapes, audio tapes, film loops, film strips, and some photographic and slide materials which are produced centrally.

Production services

If audio-visual services are part of a mass-media production centre, with existing radio and television production resources, then many of the facilities required for audio-visual working will already be in existence. Apart from audio and video-recording facilities, these will include film production, and graphic and photographic services. What will not be available, however, is adequate provision for packaging (e.g. the cassetting of tapes) and for bulk production and distribution. This means that such resources must either be added, or external contractual arrangements must be made.

A further lack will be in the area of print media. It is likely that simple duplicating equipment will be in existence (to handle camera and radio recording scripts), and a dyeline provision, for design work. But offset printing and typesetting will almost certainly not be available.

The main need for the audio-visual planner who is called upon to combine his work with a mass-media production centre is to consider the different orientation of the broadcasting media. In terms of production, he is likely to find a wealth of suitable equipment (including, for example, facilities for film animation which would previously have been outside his range). But since the materials are designed for transmission, there is likely to be a shortage, both in equipment and in space, of resources to handle the physical collation, storage and distribution of materials. There will also be little available for alternative film technologies (e.g. 8 mm) or videotape technologies (e.g. helical scan and videocassette), which are normally produced for physical distribution.

It is a difficult proposition for the audio-visual producer to move into a mass-media production centre without extensive reorganization of the premises If the whole unit can be custom-built from the outset, a good deal of time and energy can be saved.

Films, videotapes, audio tapes

Production methods for these materials have already been described; the difference is not in production, but in their form of distribution. Some materials may be produced specifically for physical distribution; in other cases, broadcast programmes (e.g. those which have been very successful, or which seem suited to repeated use in a classroom situation) may be separately issued. But production processes are unaltered, and obviously the main broadcast facilities of the media service will be employed. If whole films are contemplated, they can either be shot entirely on film (using a television studio, or a small film/photographic studio, to film any necessary presenter links), or alternatively the film could be initially recorded on to videotape, and the final programme transferred to film. The disadvantage of this process is a quality loss, inevitable in the transfer.

Further material on videotape production will be found in Part III.

Film loops, 8-mm films

Here again, when producing 8-mm film, the fact that a smaller gauge is employed does not materially affect the process by which films are planned, scripted and prepared; it is largely technical processes which are affected. It is possible to shoot 8-mm films on 16 mm and for them to be subsequently reduced (an expensive process), or they may be photographed on 8-mm (perfectly possible today, given advances in 8-mm technology, and improved performance in cameras and projectors). Optical effects (single-frame work, slowed down and speeded up photography, optical mixes and fades) can usually be achieved in the camera, provided that prescripting is tightly controlled.

The result may be mute film or a film with synchronized sound. The sound may be recorded on an audio recorder, or cassette recorder, or recording can be on to a magnetic strip at the side of the film (recorded while it is being projected). Perfect synchronous sound can also be recorded using a sound camera (again recording on to magnetic strip).

A distinction should, however, be made between the production of low-cost 8-mm films, and more professional versions, which are to be distributed in considerable numbers. If the latter are envisaged, or if animation effects of some complexity are to be included, then original production should be on 16 mm, and reproduction scaled down in the laboratories. It is often possible, for example, for complex film animation sequences which are used within television programmes to be reproduced in 8-mm format (either cassetted, or for open reel projection) for individual classroom use.

Most 8-mm films are of relatively short duration, and are meant to illustrate specific processes, concepts or cycles. If cassetted, the films can be loaded into a cartridge by an external laboratory, or special equipment can be acquired.

Film strips, slides and photographic material

The normal facilities of a graphics department will be enough to produce these items, although for production in bulk, either an external laboratory will have to be commissioned, or special printing equipment will have to be acquired. The advantages of individual transparencies or photographs is that the sequence in which they are displayed (via slide projector, episcope, or individual handling) can be arranged and controlled by the teacher. Thus slide sets illustrating in detail sequences from a television or film programme may be put together with a linking commentary. Film strips, on the other hand, have a pre-determined sequence, which cannot be varied as easily.

Commentaries may be written and printed, or recorded on audiotapes or cassettes for use in synchronized units, which show slides and film strips in association. In these units, the movement of the film strip, or the change over of the slide, is synchronized by a pulse system, contained on the tape.

Radio vision

Film-strip broadcasting

In the 1940s and 1950s one version of educational radio broadcasts included the use of film strips in conjunction with broadcasts. Each listening group viewed the film strip while the broadcast was in progress. The broadcaster's statement, "Next frame, please", was the cue to change slides.

Film-strip broadcasting was used mainly for bird and animal studies, general science and art studies, where photographs and illustrations, sometimes in colour, could be placed before the listeners and described in detail, by the broadcaster.

The system had limitations—the broadcasts were tied to the film strips and relied on listeners possessing both the strips and a projector in working order, ready at the time of the broadcast.

Without equipment at the listening end, the broadcasts made little sense and were probably a source of irritation to casual listeners. Before the use of tape recorders there was no means to preview the programmes or recall the broadcast material. But within these limits film-strip broadcasting was still useful for educational purposes, especially before the advent of television.

Radio vision

In the early 1960s, "radio vision" was born, an off-shoot of film-strip broadcasting, the limitations of monochrome television, and the relative scarcity of educational television programmes. Radio vision is similar to film-strip broadcasting in that strips are viewed in conjunction with a radio broadcast; it is different in that the broadcasts are meant to be complete in themselves, whether strips are used or not. To enable this, the cues for the changing of slides are given by playing a piece of music or using some other non-verbal means and no direct reference is made to the film by the broadcaster.

It has been called "poor man's television" and can be used to provide educational broadcast visual material more readily and economically than television programme material, or when television receivers are not common in the community. It can also be used to present material in colour, in a broadcast system providing only monochrome television.

Some of the advantages of radio vision have been mentioned. It is generally more economical to produce than television, though some of the best programmes may absorb as much time in preparation as a television series it can offer colour material and, if recorded off-air, recall of the audio is possible for replaying as often as desirable, in whole or selected parts.

The disadvantages of radio vision relate to its hybrid nature. The audience is required to pay equal attention simultaneously to a sound broadcast standing in its own right as a radio programme and a film strip, resulting in divided attention, with the vision tending to be dominant.

Visuals for film strips come from many sources and may be existing or specially filmed photographs or special artwork, diagrams or paintings.

If sound effects are seen to add to the over-all effect, care must be exercised in their selection. The specific sound of a barking dog or a motor car or a train engine linked to a static picture does not seem to work—but general background noises to a picture of a fair or a railway station do. If an individual sound effect is specifically used as an example of that type of dog or that variety of car seen on the strip it is acceptable to the audience. Similarly, the sound of a blizzard can be tied to a snowstorm photo.

Music, including specially composed music, is useful to heighten an effect or establish and maintain a mood in a similar fashion to that discussed in an earlier section of this chapter.

In language programmes, the sound track of the programme can supply the dialogue to support a story-line shown in vision through pictures or drawings.

Print media

In contrast to audio-visual media, the educational broadcasting producer is likely to be directly and substantially involved in print production, as this is the most fundamental support to his work in the mass media system. Print media are of many kinds—books, pamphlets, class packs (groups of printed materials, which are distributed to a class and later collected and re-used), teachers' notes, charts, posters. They are also of varying levels of complexity (i.e. from duplication to typesetting, one colour to full colour, line drawings to half-tones, etc.). The choice of level will depend partly upon the resources available, but even more so on the numbers to be produced; as with broadcast media, economy and audience size are inseparable. In most cases, however, the same kind of routine is followed, with a longer or shorter time allowed in between each stage, depending on the sophistication of the printing process and whether or not house-printing is available or external facilities are to be used. It is certainly to the advantage of any media service to have simple reprographic facilities (certainly stencil cutting and duplicating, and preferably simple offset printing equipment), since these will be required to handle in-house demands. A hot press for captions and facilities for dye-line printing (for design work) are also needed. But teachers' notes and pamphlets, produced in bulk, will in most cases be reproduced externally.

The production process

The production process for print media is similar, whether it is undertaken by a publishing house or by a media service (where book production is an ancillary to other media production).

One main difference in emphasis, however, is that in book production *per se,* everything is tied to a publication schedule, while in media production, print, audio-visual and broadcast media alike are conditioned by transmission deadlines (which, unlike book publishing, cannot slip even minutely without disastrous results). Both media services and publishers have found this out to their cost, when they have been associated in joint enterprises (for example, linking the transmission of a television series with a series of magazine supplements). For this reason, it is preferable for the media service to develop its own production schedules, handle its own design work, copy editing, etc., rather than contract work out to a publishing house. This is not to say that publishers do not have their own schedules (quite the reverse, as books have to be in the warehouses some six weeks before publication, to allow for essential distribution processes). Every publisher creates his own timetable, in which activities are phased from at least a year ahead, geared to expensive printing processes; the difference is that this schedule is to the week or month, rather than to the transmitted hour, and slippage, being of less consequence, is to be expected.

The same planning requirements apply to print as to other materials; synopses are needed, which are reviewed by all concerned, to ensure that the first draft of the manuscript is as close as possible to final requirements. We should therefore pick up the production process in detail from the time of manuscript submission.

The manuscript

The submitted manuscript should be: (a) clearly and uniformly typed; (b) on a uniform size of paper; (c) in duplicate (this is a minimum safety requirement; many publishers, particularly where co-editions are involved, will ask for triplicate); (d) with pages numbered in sequence.

Illustrations

If the book is to be illustrated, picture research will be carried on parallel with the writing process, either by the author or by someone within the media service (an editor or a picture researcher or a picture-research department). Sources and budgets vary; what the picture researcher, whoever he may be, must always be aware of are the requirements for good printing, and for getting maximum value for money from the printing process.

Black and white

For black-and-white halftone illustration the minimum requirement is a black-and-white glossy bromide print, sharply in focus and at least half-plate in size. If instructing a staff photographer, rather than collecting photographs from various sources, it is better to produce larger prints.

Common reduction

It is much cheaper to provide the printer with originals at the same scale as this allows him to put several items on one negative for screening. If photographs have been collected which will need reduction at varying scales, it can still be cheaper to rephotograph several prints and put them on one bromide for common reduction. (Each reproduction process is of course one stage further away from the original and loses something in clarity, but as something is always lost in printing the difference is probably minimal, and for cheaper books at least it is justified by the saving.)

Density

The printing process greatly compresses the density range of a photograph. Given a bromide with an average contrast range the printer will have to make a decision to lose detail either in the highlights or in the darker tones. When a photographer is taking or copying photographs especially for reproduction he should be instructed to reduce the density range and to pick up as much detail as possible in the middle tones.

Line drawings

Line drawings for reproduction should be meticulously clear and well defined, otherwise the printer will need to put in a considerable amount of expensive handwork. Again, they should be drawn for common reduction, in this case preferably to twice the final size.

Colour

A colour transparency should ideally be the same size as the required reproduction, but if this is not possible it should be at least 2¼ in square. With colour even more than with black and white, the most important aspect to check is the focus. If the transparency is not absolutely sharp defects show up much more in the printed result. It is also important to check for neutral balance—if the transparency is too yellow or too blue it should be marked as such for the printer. Light exposure should ideally be one shot under the photographer's reading, as it is much more expensive to correct an over-exposed than an under-exposed transparency.

This is an ideal situation, but it will obviously sometimes be necessary to reproduce from an original which falls below even minimum requirements. However, this should only be allowed when absolutely unavoidable (i.e. when the illustration is of particular importance or interest and there is no alternative source), and it should be pointed out to the printer, so that he can take special care.

Editing

First steps

When the material for the book has been received from the author, even if it is not possible to begin detailed editing at once, the manuscript should be read through quickly and any illustrations checked as soon as possible. The manuscript should also be checked to see that it has fulfilled the basic intention of the commission, and that it is not in infringement of the laws of libel or copyright; the illustrations reviewed to ensure that they are relevant and that they meet the basic requirements for good reproduction; a list should be made of any special "sorts" (i.e. characters or accents not normally used) so that the printer will have good warning if he needs to buy any special matrices; and the manuscript should be "cast off" (estimated) for length. More detailed cast-offs will be done later by the designer, and again by the printer, but a reasonably accurate editorial estimate can be achieved by the method described below.

Take four or five pages and draw a vertical line down the right hand side of each page through what appears to be the end of the average lines. For a few lines on each page count the characters and spaces to the left of the vertical line. Divide by the number of lines counted to find the average number of characters per line. Count the number of lines on an average page and multiply by the number of full pages. Count separately the number of lines on each page which obviously fall short (chapter ends, etc.) and add to the total. Multiply the average number of characters by the total lines and divide by six. This will provide an approximate estimate of the number of words.

If the manuscript has been typed in a variety of typefaces and/or on a variety of paper sizes, it will have to be divided up accordingly and each section separately cast off, hence the value of uniform typing.

Second steps

If no major revisions are necessary (or after they have been completed), the manuscript is ready to be more closely edited, to ensure factual accuracy, clarity and intelligibility of presentation. This will include marking headings and subheads for differentiation and checking that the author has indicated clearly in the manuscript where he wishes illustrations to fall. Details of type face, size, etc., will be added by the designer, but headings and subheadings should often be added to break up the text, and their relative importance should be indicated by a simple letter code (i.e. "A" head, "B" head, "C" head). This is an editorial rather than a design consideration. Any alterations made, other than the correction of an obvious error of fact, should be referred back to the author. This is not simply a matter of courtesy; if the author is not given a chance to disagree at this stage he may disagree when he sees the proofs (which can prove much more expensive).

Copy editing

The next stage is copy editing, to eliminate errors and inconsistencies of syntax, spelling, punctuation, hyphenation, capitalization, etc. This may of course be done at the same time as the main editing of the text, but for all except the simplest book it is usually more efficiently achieved as a separate process.

In order to ensure consistency in cases where two or more different usages are equally acceptable, most publishers have a "house style" (as for example always using single quotation marks, or using a "z" spelling rather than "s" where the two are alternatives). Copy editing is therefore for the most part a matter of accurate, repetitive marking. Certain blanket instructions may be given to the printer, but these are only satisfactory to either printer or publisher in very simple cases—"single quotes throughout" is easily followed, but even "z" spelling rather than "s" can lead to difficulties.

If the manuscript is at all confused or unclear, it may well prove an economy in the long run to have it retyped after copy editing. Typists' bills run cheaper than bills for printers' corrections.

Marking up

The book material will now be passed to the designer for marking up of manuscript and illustrations. If the book is integrated (i.e. illustrations and text together), the design process becomes fairly complicated, as each page must be separately planned to ensure that the illustrations fall in the relevant place. If desired, the detailed planning may be done at this stage, in which case the designer will send the illustrations off to be made while the text is being set, and illustration proofs will be returned at the same time as galley proofs of text, when he will paste them up together. Alternatively, the designer may prefer not to scale the illustrations until he has received galleys of the text and can see precisely how the text is falling. In either case the initial plan and the paste-up must also be checked by both the editor and the author.

Proofs

Proofs are furnished by the printer, for checking at various stages before the final book is run and bound. The full range is for a printer to supply, initially galleys (i.e. the text as delivered to him by the publisher, in printed form on long sheets in a few copies only, but not divided into pages), galley proofs (i.e. with the publisher's corrections incorporated), and page proofs (divided up into pages, with indications of final layout, such as the positioning of illustrations). In practice, where books are simply produced, or where there is a considerable pressure of time (as is usually the case with media-related publications) some of these stages will be omitted. Equally where cheaper printing processes are being used (such as offset printing) the practice will vary, since in these cases copies are often produced direct from typed plates.

The publishers can normally expect to receive galley proofs four to six weeks after corrected galleys are returned to the printer. If the layout of a book is straight-forward, text alone or text and illustrations in separate sections, the galley stage will probably be omitted, and page proofs will be the only proof stage. The initial schedule will probably allow about four weeks for galley correction and paste-up, and up to three weeks for reading page proofs. In practice, proof stages are regarded as a golden opportunity for making up lost time, so these periods tend to be compressed. Proofs are read and marked by the printer's reader before they are returned to the publisher; they are then corrected by the author and by a proof reader within the publishing house, and these two sets of corrections are collated and marked on to the printer's set, using a standard code.

Proof reading and correction

Proof corrections are expensive both in time and money and must be restricted to those which are absolutely unavoidable. In particular it is essential to keep resetting to a minimum; if a word must be deleted or added, then if at all possible another word of the same length should be added or deleted, otherwise a whole paragraph may have to be reset. And if corrections are expensive and difficult at the galley stage, they are very much more so in page proof, when the type has been locked into the frame, or the film stripped into pages. In computer-aided setting, correction at any stage is more expensive again.

All the above processes are time-consuming, and must be realistically scheduled. It may be as much as six weeks from the time the printer receives corrected page proofs to the running of sheets, and a further six weeks from sheets to bound books.

The media service

The phases described in this section are summarized, in diagrammatic form (see Fig. 50). They are related to the main functions of author, editor, designer and printer, but timings are not shown, even approximately, as these will be determined by both planning processes (within the entire media system) and by technical requirements. In particular, they should be gauged to tie in with such activities as piloting (proofs will be needed to help with the piloting process), the finalizing of programme and audio-visual scripts, and the distribution of audio-visual materials (which will normally be undertaken by graphic designers or supervisors); editing may be a function of producers or production assistants. For this reason, some familiarity with the system of book production as a whole is important, as well as with the detail of such processes as proof reading and correction.

It is recommended, however, that even in the smallest services, specific responsibility for the planning and production of print materials should be given to one or two individuals, and at the least a general editor should be appointed, who can co-ordinate work and draw on production and service staff as necessary. The system is relatively complex and needs the full-time attention of at least one person, even if no more than cheaply produced teacher's notes are contemplated. This editor should preferably be experienced in print production; if this is impossible, he should be given special training, and his grading should be commensurate with his responsibilities.

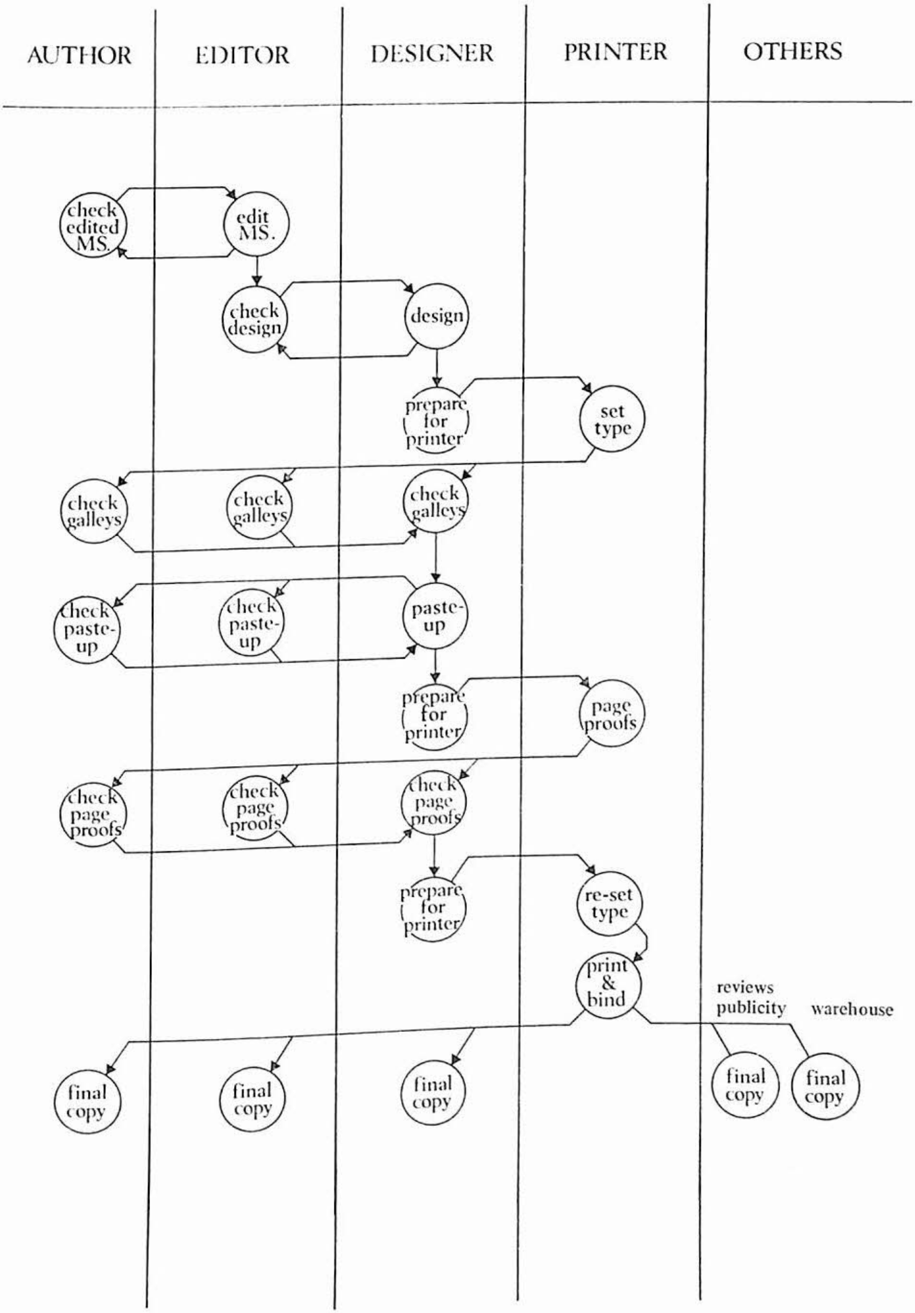


FIG. 50. *The print production process.*

Part III

Special problem areas

Introduction

The account which has been given so far of educational media production has been general: techniques and principles applied to a characteristic production. But in practice, different topics, audiences and subject areas have their own requirements—and as a result, some very specific approaches have emerged.

In the remaining chapters of this book, some of these special areas are isolated, and particular styles of production described. It must be admitted, however, that in the selection some rather arbitrary decisions had to be made. In the compass of a single volume, it is impossible to cover all fields, or all media, and with a single exception it is the television medium which is now discussed.

While all subject areas have their own idiom, it is perhaps the filds of science, mathematics and language teaching which cause the greatest problems to the producer, and accordingly these are explored in Chapters 11, 12 and 13.

The remaining three chapters are of a somewhat different order, though again each highlights a specific area of development. The first deals with the use of drama in educational television production, and with the wider range of production techniques employed. The second considers the special area of closed-circuit television, especially when this is used in a pedagogic or teacher-training situation. Finally, the last chapter looks at the newest of all educational fields—community media, involving forms of local broadcasting, cable television, and video experiment—as a topic affecting all media forms, which is currently undergoing a rapid expansion.

Thus, the character of Part III is much more personal than what has gone before. It is illustrative rather than comprehensive; it picks out elements for discussion, but relates them less deliberately to the over-all media system. It also reflects the opinions, experience, perhaps even the prejudices of a group of individual producers, all well versed in their discipline, but trading in personal convictions.

No special distinction is made between in-school and adult audiences; the time is past when separate systems catered for each group, and what is said in these pages applies generally to formal and non-formal education.

Part III may not be of equal use to every reader. But to many it should be invaluable, if it can help the would-be specialist producer to interpret general techniques in the light of special requirements, and to develop that idiosyncratic style without which his programmes will never achieve more than routine relevance and excellence.

Chapter 11

Science and mathematics programmes

Edward Goldwyn
Peter Dye
Paul Seow

Creativity

Science and mathematics programmes are a good point at which to begin to consider specialized applications of production technique, because they illustrate a characteristic dilemma of educational media. In a sense, they are one of the most technical fields of production. When educationists are planning a new media service, they frequently assume that, while the majority of programmes can be handled by generalists, in the scientific area only a specialist will be able to cope. In other words, they put a primary emphasis on knowledge, specialism and experience, rather than on creativity.

This may be, of course, a reasonable approach to the production of well-informed, correctly pitched and researched programmes. The difficulty is that, unless the technically qualified man is also potentially a good producer, the resulting programmes may be extremely dull. And one of the principal justifications for using educational media within an instructional system is that the materials which are produced should be intriguing, inventive and challenging.

A good presentation of an educational programme often deviates widely from the traditional classroom approach. It may, for example, make use of dramatic sequences, simulation or the visualization of abstract forms in a variety of symbols. This, though obvious, is often not understood—especially when one talks about science and mathematics. It is true that mathematics is a rigorous discipline; its development is based upon specific procedures, principles and mathematical reasoning. But that is no reason why its principles should not be explained in varied and attractive forms. For example, one television system made use of dramatized sequences to present a programme on number systems. In the sequence, a scientist was able to travel back through "time", to the days of the great Roman Empire. He was, not suprisingly, arrested and sentenced to death as a "barbarian"! But before his execution, a Roman centurion decided that the "barbarian" should learn the Roman culture, and proceded to teach him how to use the Roman abacus. While the scientist is instructed, the viewing students learn together with him.

Creativity therefore requires the use of a full range of television techniques—when these are relevant. And relevance is, in turn, a function of understanding, of the nature of the concept to be explored.

It is now accepted, fairly widely, that in teaching science and mathematics, a main purpose is to give the child an insight into a problem. A corollary of this position is that his insight will be more complete if he is able to arrive at understanding, in some way, through his own efforts—through personal discovery.

The same position is true of the television programme. Its creators also must be very aware of the problem—of the reason why something is being investigated, or why some concept is being taught. And that requires, from the producer, a fresh and original way of looking at things.

One producer gives as an example a course in statistics. His advisers had listed for him the concepts in developmental order: means, median, mode, standard deviation, frequency distribution, chance, etc. He could easily have produced a series of straightforward programmes upon these topics, but he felt uneasy about the reasoning behind the sequence, and he knew instinctively that, from the child's point of view, it was not enough to ask them why statistics were important. To settle his dilemma, he telephoned a number of statisticians, some in universities, some in industry. It was this second series of inquiries which put him on the right track—an appreciation that what was important in statistics was not the presentation of data, but the intellectual challenge of making the best decisions based on small amounts of information.

They produced examples such as estimated population of fish in a river; deciding (on the basis of a one-week experiment) if throwing dry ice into clouds induced rain; or whether an experimental diet fed to pigs was actually increasing the number of piglets born in a litter. In the eventual series, he concentrated on these problems which gave a real sense of understanding to the audience—but of course, once he began to deal with the problem, he found that he could not proceed without the histogram, or the mean and standard deviation.

The producer

All this has a considerable bearing upon the science and mathematics producer. A television producer, like any other professional, must first be well versed in the techniques of production. As in subjects such as history or political science or social studies, he must be able not only to handle a straightforward documentary programme, dramatic sequences, an interview or an illustrated talk, but he must have the ability to think in visual terms and draw from his own creative resources using a variety of techniques. But there is more to the producer's work than this, and here we come to the notion of "creativity".

First, after acquiring the skills for production, he develops these skills on "models" of programmes which he has seen. Then he borrows ideas or modifies them for his use. When he has acquired sufficient skills, he will be ready to create his own effects and to develop a style of his own. So, while there are no standard formulae for the production of programmes, there is a specific line of action or stages of development which are identifiable. They may occur concurrently or simultaneously, but in principle they are as follows: prerequisite skills ⟶ produce programmes based on "models" ⟶ modify and adapt from "models" ⟶ develop new approaches.

As an example of this process, we can reproduce an attempt by an experienced producer to explain the train of thought which led him to design a programme in a particular way, and to come up with certain decisions. The example is given in the producer's own words.

Imagine if you will that we're faced with the problem of teaching about the meaning of brittleness and ductility in metals. That will be followed by a second programme on heat-treating metals (how carbon steel can be left soft or hardened into spring). But already there is an absence of involvement. Who wants definitions? Only the teachers. Surely from the children's point of view there's only any meaning in 'defining' what they already know about. So we'll show heat treating as the reason for exploring the properties of brittleness and ductability.

How might this programme be approached?

Approach No. 1

Hello children. Here are two needles. They both look alike, but one bends, one breaks. We say this one is brittle, the other one is ductile. Now, two more needles. But both are the same. Both bend. I'll convert the bending one into a brittle one by heating it in an oven. Watch me. See, I put one in, heat it, and drop it into water. What do you think my needle will do if I bend it?

The trouble with this kind of script is that it is like hundreds of other scripts—predictable, putting questions for questions' sake, giving the answers in advance. Is there another approach? Let's start again, and see how we can focus on the real issue?

Approach No. 2

Here's a box of needles. We ask two girls to pick out needles and sew. The needles work. Now—take one needle behind a screen in the studio—do something mysterious to it (while hidden behind the screen) and give it back to her. Both try to sew again. One needle bends—it's no use at all. 'Now, what did I do behind the screen?' Girl takes second needle. It works. Take it behind the screen, and tell her that now this one will bend too—can the girl find any other differences? She tries. No. Both weigh the same, look the same, etc. So what has changed in the needle? Get her to hit them both with a hammer. The original needle snaps, but the treated one doesn't.

Here there is a definite sense of dramatic tension and a genuine set of questions. What did happen behind the screen? Why are the needles different? The children can become involved in finding out. For the rest of the programme you play on the tension, create some false trails. Have the needles been magnetised? Experiment to see if magnetising softens. Start giving the children clues so that they can guess ahead. Show some industrial situation with a built-in clue such as a machinist sharpening drills and cooling them in water.

The foregoing illustrates very well what the imaginative scientific producer is after, but how does one incorporate, within a single personality, the three functions of creative producer, specialist, and educator. Are not such people very difficult to find?

Certainly they are. And this suggests that in the production of science and mathematics programmes, a good deal of team work is required, in which a producer with some specialist knowledge leans heavily on his technical advisers and on his educational colleagues, and consults with them at all stages of his work. In a producer, of whatever genre, the main requirements are an understanding of how his audience thinks, and a feeling and flair for the medium. It follows that he must also have some specialist knowledge in the technical fields of science and mathematics; he cannot operate at all if he does not understand the concepts which he is exploring. But he will not be an absolute subject specialist. Few organizations can afford to employ a man who is purely a chemist, or a statistician: the producer will have to turn his hand to more varied disciplines. The important requirement is for him to be able to identify those specialists who can help him in his work, and to set up a personal relationship with them.

The script

The producer therefore begins with a range of resources at his disposal. He must be trained in production technique—especially in areas of graphics and animation, which will be very important for him in the teaching of science and mathematics. He should know about puppets, modelling, cartoon work, close-up demonstration. But the way in which he distinguishes between these resources, and chooses a particular method for a particular task, depends partly upon experience, and partly upon recognizing what he is trying to achieve. Above all, it demands an understanding of his audience.

An active audience is one which is thinking, feeling and questioning during the programme. Really active participation occurs when a pupil is able to jump ahead and guess where the programme is leading. If the producer does not give hints, show where the argument is going, the pupil is reduced to a passive observer who simply has to travel at the set pace.

The producer should, therefore, read through a script and try to anticipate how the child will react to the climax of each section. Will the pupil think: "Oh that's how it works"; or "that's clever"; or "what will they think of next?"

A script section can be ten seconds or ten minutes. So, it is important to ask oneself why that particular piece of script is there, and what is its role. Is it an introduction? A generalization to real life? A worked example? A practical illustration? A summary? A rest? A news report? An exposure of disagreement amongst scientists, etc.? Much depends on presentation. The important sections should be highlighted in advance. If something has to be taken on trust and cannot be proved, this must be admitted; the audience has to be taken into the programme-maker's confidence. Above all, the programme has to be "signposted", to provide enough information for viewers to find their way through the structure which the makers have created. If at any moment a child is asked "what is being taught, and why?", he should have an answer.

Scripts in science and mathematics areas will often be written by outsiders, especially if the subject matter is technical. For this very reason, it is important to discuss the script in creative terms at a very early stage, and to enter into a dialogue with the writer, to give him some ideas of how to exploit the medium. Plenty of time must also be allowed for rewriting externally commissioned scripts, especially if the script writer is new. It is not until the fifth or sixth script that the producer normally begins to get what he wants, because only then does the writer start to appreciate the possibilities of television. It is most helpful, if time and resources allow, to run some special training courses for would-be script-writers, which among other things should allow them to experience studio production, and develop a feel for equipment and resources available.

Programme production

The presenter

The presenter for science and mathematics programmes needs the same over-all qualities as other presenters, plus some more. He must have a basic knowledge of what he is talking about (actors are not generally suitable, except for insert sequences), and he must be able to cope with demonstrations, apparatus, and experimental work. For this reason, auditioning at length is needed, using a prepared piece of script (which the auditionee might himself prepare), and including practical studio work. It may take some time for a presenter to mature, and he should be given the chance to do so. Not every presenter of talent shows it during his first programme.

The programme outline

Very clear programme outlines are needed for science and mathematics programmes, which often make complex demands on demonstration equipment or on animated techniques. Since the subject matter may be technical, and unfamiliar to production and studio personnel, it is often helpful to add rough sketches on the outline, to indicate specific set-ups for demonstration, or to show the stages of an animation. These may save a good deal of superfluous exploration. However, the outline should not be made too firm, too early. Prefilming, and exploratory work with graphics, can often reveal weaknesses of structure, or throw up new ideas, and it should be possible to accommodate these until a relatively late stage in the planning process.

Organization

Mathematics and science programmes require as much, and frequently more, organization than other forms of educational television. The following timetable is given as a realistic example, though obviously there will be exceptions.

Stage	*Time before recording* (weeks)
Programme outline (decisions on content and treatment)	5
Models and demonstrations designed and ordered	4
Filming plans and preparations	3
Film shooting	2
Draft script (modifications produced by work so far incorporated)	2
Graphics designed and ordered	2
Film editing	1
Final script	3-4 days
Outside rehearsal	2-3 days
Recording	0

When working on a series, finding a rhythm such as the one above is important for sanity and survival. It ensures that one deals with essential tasks on a regular basis, and that the next programme in the studio does not dominate and prevent consideration of the one two weeks away.

Design

For science and mathematics, the set design of the studio is not so important as the "design" of the close-ups. Objects must be clearly seen in close-up without distraction from the background, which means that the texture and colour of table tops, cycloramas and so on must be carefully considered.

Lighting is especially important. For example, one must put effort into seeing that a voltmeter needle does not cast a shadow that will be confused with the needle itself, or that the texture of a rock crystal is not lost because of flat lighting.

Designers may not always be interested in certain basic fundamentals. It is important to insist that the designer provides a table or bench which does not wobble, which does not vibrate, and which deadens sound, is at the right height (or, better still, adjustable), can be connected to electricity, to gas or to running water if required. In fact, the best approach is to design a special display table incorporating all these features.

Filming

The reasons for using film have been explained in Part I, but in science and mathematics programmes there are some special considerations.

Sound filming or mute?

There are many situations where sound is very important indeed to establish atmosphere (e.g. inside a factory, or the clink of glassware in a laboratory). Location sound always makes a film sequence better, but working with sound is slower (perhaps twice as long in both the filming and the editing). Thus it is better to go mute if in doubt. People seem to be more imaginative when shooting mute; certainly there is a fearful tendency to confine oneself to mid-shots with a few cut-in close-ups, once presenters are taken to record dialogue on location.

How to plan filming

The work involved in a simple mute sequence (say of how voltmeters are manufactured) could be a full week's work. There would be (a) contacting the factories by phone and visiting a suitable example (1½ days); (b) planning shots, organizing, briefing cameraman, etc. (½ day); (c) on location filming (1 day); (d) viewing rushes and editing (1 ½ days); (e) writing and dubbing commentary (½ day); thereby giving a total of 5 days.

The storyboard

Filming for science and mathematics programmes is often very specific, and preplanning is important. It helps to begin work with a storyboard, in which a draft film commentary is written, and sketches of the main shots are added to the other side of the page.

The next stage is to look at the pictures which have been sketched, without the commentary, and see if anything is missing—this is essential, as the final result will be dictated by what has been photographed, not by the written words. Even at this early stage, final editing must be taken into account.

The draft commentary should not be treated as an exact precursor of what will be heard in the studio. It is a guide to precise filming, and the odds are that it will bear little relation to the ultimate form of words. But even at this stage, the commentary can be rewritten several times, before filming actually begins, to reflect the thought already put into the exercise. It is far less expensive to edit on paper than on film.

Location

The main features of prefilming have been described in Part I, and science and mathematics programmes are no exception. It is important for the producer to be ready to depart from his planned sequence, if necessary; not only will some shots prove impossible in the event, but new opportunities are found, when the scene is actually viewed through the camera lens. Moreover, at this stage a number of minds are being concentrated on the same problem, and the cameraman and other unit members will often have useful suggestions to make.

Editing

It is sometimes said that shots should be held longer in educational science and mathematics programmes than is usual in television, but to use this axiom in an unthinking way is to make sequences very dull. The length of time occupied by a shot must depend on a judgement of what the audience is getting out of it. For example, shots of cells under a microscope are usually rather puzzling. Suppose that a general audience might find such a shot interesting for ten seconds—how long should it be held in a science programme?

The answer clearly depends upon context. If the previous fifteen minutes of the programme had been focusing the audience's minds on "movement", and the producer simply wanted them to see that "life is movement" on a microscopic scale, ten seconds would do well enough. But if the programme had raised a problem of how animal cells move, then they would be motivated to look longer at the shot, to pick out the answer to a question being adressed to them.

The same kind of decision therefore has to be made in the cutting room as was made when writing the script—programmes depend upon tensions which are created by posing genuine problems and seeking genuine solutions.

Film commentary

The final film commentary is very different from what was prepared for shooting purposes. This new commentary is being prepared for the audience's benefit (not the cameraman's), and important factors are: (a) to use as few words as possible; (b) not to describe things which can be seen (e.g. "here you can see a car"); (c) to inform the audience of the reason why they are being shown a picture (e.g. "Watch how the passengers move as the car goes fast round a corner"); (d) to give information not in the picture (e.g. "This is a magnification of 20,000 times", or "it took fifteen years of experiment to be able to film cells like these"); (e) to use simple, clear and everyday language wherever possible.

Before the studio

In the areas of science and mathematics, rehearsals are especially important. This is not purely a word rehearsal; the outside rehearsal should include rehearsing the demonstrations, using the real equipment proposed. There will be little time available in the studio to go over such demonstrations for the benefit of the presenter, and he must be thoroughly at home and confident before the studio day.

Preparation

Anyone putting on a science series needs to have a laboratory preparation room with a full-time technician at work. His job is to be in touch with schools and university departments, securing equipment and expertise to make the demonstrations as designed. For some demonstrations it will be possible to borrow, but most will need to be specially devised. Even borrowed equipment often needs to be modified (thicker needles and bigger calibrations) for use in the studio.

The preparation room should have sinks, cupboards, glassblowing tools, lathes, drills, etc., comparable to a simple science preparation room in a university.

Ideally, the technician should be a man with plenty of experience in science teaching, and someone with imagination and creative ability.

Studio techniques

Studio production follows the routine already described in Part I, but there are certain techniques which, to the science and mathematics producer, are of first priority, and which feature much less rarely in other forms of programming.

The close-up

Probably the biggest need in the presentation of science programmes is to show things clearly. There is usually no shortage of visuals, and most topics (except chemistry) are natural for television treatment, but it is with the presentation of this detail that the producer faces his biggest problems.

The range of dimension is enormous, and in every case the producer must visualize clearly what it is that students must see. It is of no value to show an impressive fuse box if the student needs to know what a fuse-wire looks like.

Close-up work in the studio must be a speciality of any producer of science programmes that are studio based. This is a production area in which many technical producers and technicians have had little experience, and the producer must persevere in encouraging the technical crew and the designers to produce really good close-ups. Where turret lenses are fitted the best results are obtained by using a 2-in or 3-in lens very close to the subject, (as close as a few inches). This closeness causes lighting problems because the camera will block out the normal lighting, and when these lighting problems are overcome there may be further difficulties if several very close shots are needed of different things, as each has to be specially lit. A useful method here is to use a revolving table, with the small objects so placed on the table that by rotating it and leaving the camera and lights fixed as they are presented one by one to the camera lens. A slight improvement in magnification can be effected by using the 8-in lens on a special extension mounting (allowing a greater distance between the lens and the target on the camera tube). This can then be used with a greater distance between lens and subject than with the 2- or 3-in lens, thus decreasing the lighting problem. However, it renders the 8-in lens useless for normal distances and the mounting may be in the field of view of other lenses. Where zoom lenses are used some have close-up attachments which can be flipped in front of the zoom assembly.

As a general rule a good close-up system should give a minimum field of view of about the size of a matchbox. Some extra care should perhaps reduce the field to half the size of a matchbox. Fields of view of less than this size can be obtained only by very specialized lens systems, and are not normally attempted in the studio.

To obtain fields of view smaller than a matchbox, photographic techniques can be used, either still or cine, with macrolenses or with microscopes with special attachments. Before venturing into this field one should check with commercial scientific suppliers or a local university for 35-mm transparencies of microscopic views. This could save a great deal of time and money.

Demonstrations and demonstration models

A demonstration is intended to answer a question, such as: "What happens when a body is acted on by a constant force?" "Does a rat remember a maze worse after electric shock treatment?" or "If we cut off the corners of a triangle and join them up, what angle do they combine?"

Demonstrations can be used (a) as a confirmation of a theory or an experiment —i.e. they can be used in situations where the audience already knows the answer— or (b) to resolve a dilemma, confirm or refute a hypothesis or, most important of all, by an unexpected result pose questions to the audience.

The latter (b) are far more interesting than the demonstrations which simply confirm.

Demonstrations in the studio

The following notes may help in handling demonstration sequences.

Spend time going over the apparatus, explaining its parts before the main experiment. If it contains a thermometer, for example, show that it works by warming it with the fingers or cooling it with a piece of ice. Leave plenty of time for the audience to become familiar with its complexity —and then revise or inform them of the hypothesis involved before proceeding.

Make the size of the demonstrations convenient for the lenses of the studio cameras and the size of the presenter's hand.

Distinguish between demonstrations which show the real effect, and those which help the audience to remember something. For example, by burning magnesium upon a sensitive balance, one can show that it gets heavier. That is a real effect.

Compare this with a situation where a presenter explains that when two hydrogen atoms combine to form helium in a thermonuclear reaction, the helium weighs less than the original hydrogen atoms (i.e. that weight loss is equivalent to the released energy.) This could be demonstrated by picking two heavy hydrogen molecule models (made of ping-pong balls) from a balance—squeezing them together to form a helium atom, and putting them back on the balance (which is controlled by an assistant behind the bench), and lo and behold—they are lighter! One needs to watch the words very carefully, or children will be confused and think that something has been proved, when really the demonstration was no more than a three-dimensional animation. In other words the demonstration must state its intentions honestly.

Demonstration models

These are attractive, and make the explanation much easier, if the presenter has access to large models of ammeters, rheostats, electric generators, or whatever is being demonstrated. Although not obvious items, large models should be tried by every new producer.

Graphics and animations

Graphics and animations should match the demonstrations and films. Details on the real equipment should be matched on the graphics (e.g. if balls roll from right to left in reality, they should also do so in the animated film). The enormous power of graphics to capture and simplify a situation will be badly lost, unless the mental model which the audience has of the film or studio situation transfers easily to its graphic representation.

The use of graphics should be thought through with care, as although they are indispensable in representing complex situations simply, they are not always interesting or intriguing in themselves.

Improvisation

Sometimes it may also be necessary to improvise materials to illustrate a specific point; there will be many occasions when, with a little forethought and ingenuity, special apparatus can be designed to present scientific or mathematical concepts on television. After all, the standard range of demonstration equipment has been designed with a classroom or laboratory in mind; adding a television format gives a totally new potential. Nevertheless, when such experimental devices are used, they should be adequately piloted with technical staff present: otherwise far too much time will be spent upon them in the studio.

Some problem areas

One of these is the representation of very large dimensions or distances. How does one represent, for example, the vast distances in space, yet show the stars and planets as anything other than a point of light? How does one show details of a planet and at the same time, convey the idea of its distance from its neighbour? And all this on a small screen perhaps 20 ft away from the classroom viewer. It is doubtful if television can contribute very much to the child's visual appreciation of the vast distance involved in the relationship of heavenly bodies, and the limitation should be acknowledged.

Many science planning committees tend to seize on television as an answer to the problem of how to show children industrial processes without class visits to factories; but with few exceptions, industrial processes that are full of atmosphere, excitement and impressive machinery do not translate well on to the television screen. If a factual and logical presentation is used then the result is usually dull. Attempts to enliven the programme can distort the teaching message, and it is best to present an honest, clear account without trimmings.

There are many problems in using animals in the studio, but the advantages are that a live animal is of interest, because it moves and may do something unexpected—the interest gained is transferred to the whole programme and it is difficult to fail. The problems are first the normal ones of handling. It is preferable to have animals handled by an expert rather than kept in a cage, but however they are presented, care must be taken to make them as comfortable as possible for the whole of the time that they are in the studio. For some animals the studio may be too cold, and for others too hot. Nearly all animals dislike studio lights, and most need to be fed. It is preferable to have their normal handlers looking after them, even if this means extra expense.

The use of children in the studio

At one time this was thought to increase audience empathy. The practice has been largely discontinued, because if the programmes are to be very highly structured, with carefully related sections of film, demonstrations, animations, etc., one cannot have the flow interrupted or stopped for five minutes by questions from the audience, and also the teacher does not know whom to address. If he looks at the studio group, the viewers will feel that they are peeping through the keyhole of a class. If he looks primarily at the camera, the class will feel unnecessary.

However, pupils can be, and often are, used as part of a demonstration. For example, one can make a film showing the kinetic theory of gases, by filming specific demonstrations from the roof of a school looking down in the playground where children act out the movement of molecules. Each with a shirt of the appropriate colour, they can be used to demonstrate the mixing of gases, causes of gas pressure, etc. Children enjoy seeing themselves in this kind of "animation". Equally they can be used to assist in studio or filmed experiments, since in that way they do not interfere with a closely planned structure.

Conclusion

This chapter has described something of the perspective of production for science and mathematics programmes. The main moral to be adduced is this—evry producer needs a *repertoire* of techniques at his disposal, and he will learn from experience what is likely to be successful with particular audiences. But no set of techniques is enough without a thorough understanding of the reasons for their use. The search for clear objectives is not an academic exercise; it is a means whereby producers can be encouraged to apply their experience and resources to specific tasks in hand.

Chapter 12

Language teaching by television

Jean Dawes
Carol Wiseman

This chapter is divided into two discrete parts. The first part deals with formal language instruction, using the television medium generally in an in-school situation, where learning is structured, and where television is a tool within a highly organized teaching process. It relates in particular to "second language" teaching, where an important international language of communication is taught throughout a school career, to prepare the pupil for his future.

The second part deals with a far less disciplined situation, in the mounting of language programmes for adult audiences. Characteristically, these are programmes designed to give adult viewers some conversational and cultural familiarity with countries which they are about to visit on a holiday tour, to enable them to communicate at least at a basic level. In this case, it cannot be assumed that language learning is a controlled process; rather, the adult learner is likely to be working on his own, and his continued motivation is largely the responsibility of the television medium.

It will be seen that different techniques are demanded of each situation. Yet it will also be seen that there are basic similarities between the two functions—though the degree of motivation and tutelage may differ (and hence the mode and means of presentation), in both cases it is language which is being learned, and there must be some common denominators.

Although the chapter deals with the role of television in language learning, this is very much an area in which multimedia presentations are important. Languages are meant to be read as well as spoken, and printed texts are necessary; equally pronunciation and conversational skills depend upon practice, which records and tape recordings can provide. In the school situation, a genuinely multi-media presentation can often be attempted; in the adult context, the multi-media kit is an excellent vehicle, but because the audience is not under control, it cannot be assumed that all viewers will be following all materials faithfully, and some kind of compromise will have to be reached. This (as will be seen below) poses problems to script writer and producer alike.

Language teaching in the school

The nature of language teaching is such that literally every word and every visual accompanying every word is important.

Both the producer and director of language teaching programmes should be fluent in the language that the programmes are teaching and both should have some language teaching experience or be familiar with the methodology being followed. If this is not possible, then a consultant language specialist, who will most probably be the scriptwriter, should be made a full-time member of the team, to be at hand at all stages of the preparation of the programmes.

The planning stage

What must the director know?

He must understand fully the aims of the series, since upon these aims will depend the manner in which the series is produced and directed.

He needs to know:

What is to be taught:

1. Which of the skills—understanding, speaking, reading or writing—is the primary aim and which, therefore, he must concentrate on.
2. Whether the programme is to teach new material, provide drill and practice material, revise what has been taught, or be enrichment. He will know then whether his presentation must be fairly slow and clear or whether it must be at natural speaking speed.

To whom:

1. Will the students be captive or non-captive—highly motivated or only casually interested? In other words, how much onus will there be on him to provide extra interest through is production?
2. How old will they be? Can the characters be puppets, cartoon characters, children, adults?
3. What is their background, taste and maturity? Do the planners want to project the culture and way of life of the native speaker or is it only the language itself as a means of communication that is required? If the latter, then the situations and contexts should be set in an environment familiar to the audience.
4. What is their level of sophistication? Can any humour be subtle or must it be obvious? Can there be humour at all? Can technical "tricks" and effects be used or will they confuse the learner? Are the "conventions" of television familiar? Can "dream sequences" or "flashbacks" be used to teach the future or the past?

How?

1. What methodology is to be followed? Are the students to be given time for thought before responses? Must all new material be seen in written form on the screen? Can there be any written material on screen at all? Must speech be at natural speed, with natural slurring, or must it be clear and precise?
2. Is the programme series to be part of an in-service teacher training programme as well as a teaching aid? Is, therefore, the manner of the lesson as important as the matter? If it is, then the director must become thoroughly familiar with the methodology, ideally through observation of model lessons.

How can the director advise the planners and script-writers?

Language teaching by television has been characterized until recent years by stereotyped approaches and well-worn formulae. In the last few years many new devices have been tried and many experiments in format have been made, but there has not been sufficient communication among practitioners to make the results widely known. This is especially true in the field of English teaching. Another reason for much of the conservatism has been the relative scarcity of language specialists who are also fully conversant with the medium and its potential. Too many courses have been written by teachers who are book-oriented and cannot *see*. It is a major part of the producer's job to help the script-writer look at his material from a visual point of view and to banish any preconceived idea that, for instance, television can only offer the language teacher dramatized sequences with captions and verbal explanations. He must point out that there is no aspect of language teaching that cannot be taught by television, though the medium is more effective in some areas than in others; that the student can be made to speak, read and write as well as look and listen; that drill work on television is very effective if carefully controlled; that "situations" do not have to be playlets, but may —often more effectively—contain as little as one sentence (contexts); that the number of situations and contexts is limited by the imagination of the director and the facilities available. Many devices and techniques such as those mentioned later in this chapter could be explained to the writer, who may then gauge their effectiveness for getting over what he wants to teach.

Two major limitations of the medium must also be pointed out:

First, that there can be no feedback, so no check on repetitions and responses, even though control answers as in language laboratory drills would be advisable. The lack of feedback means also that there is no way of knowing whether the students have understood a teaching point or an instruction for response. It is therefore always advisable to explain teaching points or instructions in more than one way and always to give examples. If possible these sections should be tested out on a "guinea pig" learner.

Second, that a television programme is at least half the duration of a class period —and, therefore, the lesson must not be overpacked. There is a great danger that the course devisers will try to fit a week's work into 20 minutes, just because there is only one programme per week. For clarity and time-saving, the use of the mother tongue can be invaluable. This is anathema to many language teachers, but the director must point out the advantages, which may outweigh the controversial disadvantages.

A plea can also be made at this time for a choice of vocabulary, especially in the teaching sequences, that can be clearly and unambiguously visualized. In return the director can help the writer to get over many of the difficulties of vocabulary or structrural limitations by the use of the visual—the gesture, the half-finished sentence, action without words.

The production stage

Writing the camera script

The language programme is perhaps the only kind of ETV programme which must necessarily start with the words fixed and not progress from the story-board to the word-script. A few alterations can be made to tie in with the visuals (after careful consultation with the script-writer) but usually, when the script comes from the specialist, every word, every sentence is placed in its position for a definite pedagogical reason and must not be altered. Care must be taken in rewriting the script that long and short forms are reproduced exactly as in the original. "Isn't" is not the same as "is not" in a language lesson.

It is a good idea for the script-writer to indicate in his word-script where close-ups are essential, especially when a new vocabulary item is being introduced. It must also be borne in mind that all the visual information necessary for the understanding of a particular sentence or situation should be included in the shot. This frequently means that the director cannot script in the most artistic or dramatic way in a situation. For instance, if he is trying to teach the plural forms, then it is necessary that two people or things are in the shot, and sentences like "He is crossing the room", need long shots to contain all the relevant information.

The camera script must be very specific especially in cutting points. In the studio it is very easy for the director to forget important language teaching points unless the script reminds him. For example, cutting at the wrong moment can change "This is a cup" into "That was a cup".

Sound effects too must be exactly cued, otherwise the future may become the past —"The dog barked" *must* follow, not precede or be simultaneous with, the effect.

Choosing and preparing visual sources and materials

It is too easy to be boring in language teaching, especially since one of the golden rules is *repeat*. Thus the producer/director is often faced with the problem of presenting the same sentence or sequence again and again. In order to keep the programmes interesting and lively, he should vary his visuals as much as possible. A situation or context or teaching point can be illustrated live or through still captions, drawings, cartoons, photographs, film, film animation. We will consider each in turn:

Whatever type of visual is used there must be no ambiguity, especially when there is no teacher at the receiving end to correct false impressions.

Live action

This is in straight teaching sequences with or without aids like blackboard, flannelgraph, magnetic board, flash cards, superimpositions, and props or through dramatized situations, either short playlets or brief "contexts" of one or two sentences.

Sets may be realistic or representational. "Realistic" sets take up studio space, and unless the studio is very large, the number of different situations may be limited. The number of sets available can be increased in two ways—by using part of one set as part of another, or by using two or three plain backgrounds in turn with changes of props, actors and/or action (Limbo lighting may take up as much space in the studio as a realistic set.)

Care must be taken with parts of the set and properties which are mentioned in the script—a writing table, for instance, cannot be substituted for a desk, a plate for a bowl, etc.

If a blackboard *must* be used by the television language teacher (which should be avoided if possible since this is the one aid that the classroom teacher definitely has, and for non-captive audiences a blackboard is redolent of boring school lessons) it should ideally be matt green and the writing on it very clear. Flannelgraphs and magnetic boards are a little more interesting and there is the possibility of rearranging and building up sentences upon them. This is, however, better done by animated captions or film animation, unless one of the aims of the programmes is in-service teaching.

Puppets have been used most effectively for teaching language, and small children especially show great enthusiasm, but the director must be very careful that the voices used are not too distorted and that the stress and intonation are correct. Unless the operators are very skilled, moreover, there will be great difficulty in matching words to mouth movements, very important when the audience is relatively unfamiliar with the language.

In dramatized sequences the drama must always take second place to the teaching and though it may be visually interesting to give a slice of "building up" or "linking" action without words, this is time taken from the actual teaching and should be reduced to a minimum.

Film

Filmed sequences can bring the outside world into the classroom, but as with live action, dramatic effect must take second place to teaching and too much "building up" action will be wasteful of teaching time, however attractive it might appear.

The director must always time very carefully when making out the shooting script, because it is imperative that the action goes on long enough for the words that have to be said. The words should not have to be altered simply because a shot is too short. Pauses for responses or assimilation should also be carefully timed. Shots that are too long are not critical, unless they make a series of examples or a communication exchange disjointed. Getting the timing of action exactly right may seem needlessly arduous on the day of shooting, but a correctly timed result will be well worth the frequent retakes. Each shot should be rehearsed carefully with a stop-watch so that the actors know exactly the speed required. The director must note in the shooting script where there is to be a superimposition or a wipe, so that important action is contained in the top two-thirds of the film and the bottom one-third is fairly dark.

If the film is shot with sound, it is important that the words are absolutely clear, or the result will be useless for teaching purposes.

Library film may be used, though in order to get the exact action that is required, it is often more time-saving to shoot one's own. It can be useful in teaching the past (as remembered sequences or flashbacks) or the future (as dream sequences) provided that the audience knows these television conventions. Documentary-type film may also be useful for lessons on which written composition will be based. Short sequences are invaluable if a large number of "contexts" are required, but sequences that fit programme requirements exactly are often very hard to find.

Film animation and cartoons

Film animation, though expensive of time and money to produce, can illustrate many things that cannot be filmed. It also cuts out extraneous visual information (visual "noise") and can add interest and humour to the programme.

If time is limited in the studio, or the timing of caption sequences is critical (for example in a drill of the "listen-repeat-read" type or a question-answer sequence with visual cues) then the pre-filming of the sequence with visual cues appearing with split-second timing (a form of film animation) can save time and tempers in the studio.

The use of animated cartoons can also widen the language scope of the writer, who is able to include in his script "unfilmable" language such as "The house is falling down", "He fell over a cliff", "The cat danced with the dog". "He caught a big fish", etc.

Another major use of film animation is as an extension of the animated caption when it is impossible to include all the movements necessary to the illustration of a teaching point or a structure formation in one caption. If the film animator is very good, cartoon characters can rearrange or remove or point out words, adding to visual interest and to the teaching impact.

Still photographs

Photocaptions are very useful: (a) in vocabulary work; (b) as stills, isolating moments from a foregoing live or filmed situation for repetitions of sentences, or cues for drills or question-answer sequences. The photograph may be made into a convention of the series differentiating the past (still) from the present (action).

The photographer, as also the film cameraman, must be informed whenever there is to be any superimposition or wipe, or when any words or symbols are to be added in any way to the photograph during the programme. He can then ensure that necessary action or objects are contained in the top two-thirds of the picture. It is useless to wipe in the words "He stood on the box", if the wipe obscures the box.

Line drawings and cartoons

Line drawings with or without words can be most useful in illustrating new material since all visual "noise" can be excluded. Most often a drawing is better than a photograph, because it is clearer. Some things may be better illustrated in caricature or cartoon than in realistic photographs; for example, "He eats too much", "They have been waiting for a long time".

The style of drawing of both diagrams and cartoons must be within the experience and understanding of the learners—especially when symbols such as crosses for the negative, ticks for the positive, money signs, movement signs, etc., are used. Animation accompanying the drawing or camera movement (pan, zoom) might help to clarify.

Cartoon drawings can be animated by the movement of cut-out figures and objects in front of a still background. When skilfully manipulated, these can have the same effect as animated film cartoons at a fraction of the cost and preparation time. If the characters are required to speak, however, mouth movements will be unnatural and often look ridiculous when the cartoon character is facing forward. A side view of the face is more acceptable, but can still only imperfectly imitate speech movement. (This is applicable to film animation also, unless the animator is highly skilled.) As in the case of puppets, this is a device suitable only for children.

The written word

Most language teaching programmes include a certain amount of reading. The written word may be shown on screen by means of captions (or slides), the blackboard, the flannelgraph, the magnetic board, flash cards, etc. Whatever is used it is imperative that the words are clearly seen. The words are in a foreign language and therefore not so easily read as those in the mother tongue, especially if the two languages have different scripts. In languages using Roman script lower case is preferable to upper case, since it is more clearly readable. In languages using Arabic script the size of lettering must be much larger than is normally used on television, because the position and number of dots is critical and dots are easily misplaced or obliterated altogether with the slightest technical fault in transmission or reception.

Captions should not be overcrowded. Unless comparisons are being made between two sentences, it is better to have only one sentence per caption. If there must be two or more sentences, then it is better to have the caption animated, revealing one sentence at a time, so that the reader is not confused with too much information unread at any one time. One sentence may in fact appear in two parts, provided that there is a natural structural break (but in such cases a language specialist must be consulted).

Superimposition of words and sentences has a very useful function:

1. Over live action it has the advantage of accompanying movement to clarify and contextualize the language. Cutting away to captions would hold up the action.
2. It can point out relevant language points without changing the context and also without comment.
3. A word or phrase from a sentence that is being spoken may be highlighted by superimposition without taking it out of context—a form of underlining of the spoken word. Care must be taken, however, that it is superimposed at the right time.
4. Superimposition of words over the cyclorama or other plain background at the side of the presenter when he is teaching can be more effective than the use of a blackboard. The presenter can "point" to these words and erase them at a wave of the hand, if properly rehearsed.

Especial care must be taken over words that have to be superimposed; doubt about even one letter can cause confusion. If the superimposition is in any way less than perfect, it would be better to use some other device: a horizontal wipe-in; the masking of the bottom third of the lens of the camera or the telecine scanner and superimposition over the masked section (here the mask must be straight and steady); the placing of the presenter behind a plain, dark bench or counter.

Diagrams

When pronunciation is being taught, the diagram of the mouth and speech organs may be shown and animated if required (most efficiently done by film animation). This can be very effective if the audience will accept such diagrams, though an unsophisticated or very young audience cannot see the connexion between cross-section diagrams and their own mouths. A mix from the face of the teacher to the diagram might help clarify, but the mix must be exactly placed, otherwise even greater confusion might arise.

The teaching of intonation can also be done by diagrams, but the producer and director must find out which symbols, if any, are understood by the audience. Intonation diagrams are almost impossible to animate simultaneously with speech in the studio; one film animation is advisable.

A close-up of the mouth itself is finally possible. The best effects are on a wide-angle lens, with the mouth only a few inches away from the lens, or on a very narrow-angled lens—although here great car must be taken that the subject does not move out of focus. Mouth close-ups are distasteful to some people, however.

Devices for cueing responses

Responses can be cued visually or through sound. But whichever method is used, the cue should leave no doubt as to *when* the student must speak—the visual must not be faded in slowly or the sound be of too long a duration. Some students may start speaking when they first see the visual or hear the sound; others may wait until the fade-in of the sound has been completed. This will cause confusion, especially when the audience is a classroom of children, who will be discouraged from responding if they cannot respond in unison.

Visual cues may be as follows:

1. An indication by the presenter or actor.
2. The mouthing of the response by the presenter.
3. The superimposition of a symbol, provided that the student knows exactly what it means. A cross could be used for a negative answer, a tick for a positive answer and a question mark for a question. A single symbol can be used when a short answer is required and a row of symbols when a long answer is required. Care must be taken that the symbol is easy to define in superimposition. A pointing finger, for example, besides being very difficult to draw, does not superimpose clearly.
4. A key word at the beginning of a sentence may be superimposed or wiped in or held up by the presenter as a flash card.
5. A memory-jogging picture is often necessary so that answers to questions may be only tests of language and not tests of memory.

Sound cues may be:

1. A bell or buzzer—not of too long a duration.
2. A musical note from an instrument like a xylophone or piano. This is often more pleasing than 1.
3. Word cues from the presenter.

Presenters and cast

The presenters and cast engaged must of course be exemplary speakers of the language being taught, though it is not necessary for them to be native speakers if their command of the language is complete. Dialect speakers, though native, should be avoided whenever there are major phonemic differences from standard, otherwise confusion will arise at all but the most advanced levels. A variety of voices, especially male and female, will benefit the student. Language teachers with some acting ability or fully professional actors are the best presenters, since the former understand how to handle the language in a teaching situation and the latter are trained to follow directions of all kinds implicitly.

The direction stage

Dry runs

Dry runs are essential, since the cast must be thoroughly rehearsed in how and when to say every word of the script. This must never be left until the studio rehearsal. It is not possible to relay detailed instructions as to speech delivery and length of pauses, etc., through the medium of floor managers, who often do not speak the language that is being taught or, if they do, only imperfectly.

Both the language specialist and the director should be at these dry runs. The director as well as the cast should note carefully all instructions from the specialist, especially if he will not be present at the recording.

The cast must be made aware of what they are teaching before they learn their scripts. They must know: (a) that the order in which things are said is important; (b) that they will not be allowed to *ad lib.* if they forget their words. What may mean the same thing to them as fluent speakers of the language may be way above the level of the students; (c) that they must pay attention to long and short forms. They must not, for example, say "can not" or "can't" if the script says "cannot", even if they themselves do not use "cannot" in normal conversation.

Special attention should be paid at dry runs to:

1. *The rate of speech.* This depends on the methodology being followed and the level of the audience. If the students are slow learners or have no other exposure to the language, then the speech speed should be slowed down. But if it is necessary to slow down the rate of speech, the cast must nevertheless retain the correct intonation and stress patterns. This is very difficult even for native speakers, and it would be worth while for the linguistic adviser to spend some time coaching the cast in this technique before the series begins.
2. *The position and timing of pauses.* When the pauses are for student response the cast should be trained to say silently to themselves what the student should be saying. If the students are only to be allowed time to say a sentence once at the same speed at which the model sentence or the question was delivered, then the actor should say it to himself at that speed. If the student must be given time for thought, or if he is to repeat a sentence twice, the actor must adjust his speed accordingly. Generally he should give a pause of one breath's length before saying the expected response to himself, and then a little more than one breath before going on to the next sentence.
3. *The intonation of sentences which are said in isolation—in drills or "contexts".* Native speakers often feel that there should be a variation in intonation in a list of similar sentences, but for teaching purposes the intonation must be "neutral".
4. *The rehearsal of caption sequences.* Captions should be read clearly and with correct intonation and stress. The presenter must guard against overstressing the part of the sentence that illustrates the lesson's teaching point (e.g. he must not say, "I *would* go, if you *went*"). Animations should be explained fully and the cast told when they are to read, if at all.

5. *The rehearsal of film sequences.* Rewinding of film in the studio is so time-consuming that these sequences *must* be fully rehearsed beforehand. The director must be very specific on cue points since, if the teacher misses a cue, the commentary cannot be slowed down or speeded up or shortened as it could be in other subject areas.
6. *Presenters should be trained in the art of encouraging the student to respond,* by helping him through facial expressions, gestures, nodding or shaking the head, pointing, beating time, mouthing replies or any other visual encouragement that is appropriate. This is often either omitted from the presentation or overdone. An acceptable mean should be found.

In the studio

Before the director goes into the control room, he must make a double check on the order of captions and slides, since there are often many captions very similar in word or picture content, as well as frequent repeats of captions or caption sequences later in the programme. The floor manager must have all the captions well marked and know exactly when to change and how to reposition them.

During direction, timing is all-important—the timing of editing and the timing of pauses especially. If the director is at all worried about his ability to time properly while attending to all his other duties, it is as well for him to delegate this to the language specialist, if he is present, to the P.A. or even the vision mixer. Someone in the control room should be repeating when the student is meant to be repeating, or reading captions at assimilation speed. Whatever the purpose of a caption, it is most often worth while to pause after it has been read for the student to assimilate the information, and perhaps to repeat to himself or out loud. (The director should check this with the language specialist in case one of the subsidiary aims of the programme is to make the student read more quickly, to eliminate syllabic reading.)

Animated captions whose purpose is to show the formation of structures should not be animated so quickly that the student cannot take in what has happened, nor so slowly that an incorrect sentence is on the screen long enough to be read in its entirety.

If a choice has to be made between the definition of a superimposition and the definition of the visual behind it, then clear definition of the super must be preferred.

The director must train himself to listen to the words as carefully as he looks at the visuals. Any mistake in the words of the programme must not be allowed to slip by, although it may not seem important at the time. He will be saved hours of argument and editing time later, if he stops the recording at once.

Special effects

The special effects bank allows the director to: (a) wipe in captions instead of supering. This is much clearer and neater; (b) use the split screen for contrasts—between the negative and positive, for example; (c) use a split screen for "minimal pairs" exercises, where the student must recognize the difference in pronunciation between pairs of words like "bill/pill", "bee/pea", etc.; (d) wipe in—horizontally, vertically, in a corner, etc.—dream sequences, flashbacks, or visual clues to question-answer sequences; (e) show both the speaker and the thing or action he is talking about at the same time by wipes, inlays or oberlays; (f) to guarantee a perfect "super" by overlay.

Sound

It is imperative that the sound is of high quality. The students are listening to a foreign language, a set of sounds and combinations of sounds which is unfamiliar to them.

Sound effects must be exactly on cue —especially the cueing for responses. If a bell rings after the teacher has said, "a bell rang", it is an amusing slip in the mother tongue but it will cause a great deal of confusion in a foreign language.

Although in many places it has become something of a convention to have background music whenever there is mute film, especially of outside sequences, the director of foreign language programmes must always remember that spoken words must be heard very clearly, especially when the speaker is out of vision. Music of any kind tends to distract the attention of some students and familiar and distinctive tunes demand attention. It is advisable not to have background music at all during narrative sequences, unless the sound mixing is expertly done.

Music accompanying film animation or captions showing changes in structure taking place can be very effective. Here the music can fix the structures in the mind of the viewer. (A lesson learnt from television commercials.) The music and movement must synchronize exactly. If the animation is on captions in the studio, this must be very carefully rehearsed. When the animation is to be prefilmed, the music must be chosen before the shooting script is written and the movements timed to fit exactly. The sound should then be dubbed on to the film itself, as it almost impossible to fit the sound tape to the film in the studio.

Language teaching for adults

We now move to a far more casual, freer environment for language teaching.

Particularly today, with foreign travel increasing both for business and tourist purposes, there is a growing need for a useful, conversational knowledge of languages. Television can play a valuable role, because of many, distinct advantages over other methods: (a) it can introduce attractive native speakers with good, clear accents, and absolutely up-to-date phraseology; (b) it can use the best advisers and consultants and extend their teaching to a maximum audience; (c) it can give the authentic flavour of the country, ideally by showing film of people in real situations; (d) it can draw on the resources of the medium generally to present the language in an interesting and exciting way (e.g. a dramatized story), thereby providing a strong motivation for understanding; (e) it can provide a strong stimulus for further study.

Of couse, it has its limitations. It cannot in perhaps a 20-30 minute weekly programme teach very much of a language. Ideally, the role of the television programme should be to expose the student to as much contextualized authentic language as possible, leaving explanations, grammar, vocabulary and practice to ancillary materials and to the teacher. This is not so much of a problem at the school level, where the television programmes in almost all cases will be supplementary to a teacher-based course, but it does present a problem at the adult level.

Programmes for adults

Unfortunately the student will vary from the once-a-week viewer to the careful learner who does in fact make use of all supporting materials. So it is extremely difficult to pace any televised language course adequately for all users, and the producer is forced to cater for allcomers and provide a certain amount of explanation and practice in the programmes.

However strong the motivation for learning, adults often find difficulty in continuing a televised course, perhaps because of limited time, or inconvenient scheduling of the programmes, or simply because they have lost the facility of concentrated study. The series must, therefore, provide a strong element of entertainment, a real sense of progress from week to week, a rapid ability to "speak", and a growing facility for comprehension.

Since only a minimal amount can be learnt each week from the television screen, and because of this need to keep the course practical, language should be restricted to a real "survival kit"—basic necessities of life in a foreign country; how to request a service, ask the way, order food and drink, book a hotel room, change money, etc. The student should learn and practise the key structure needed for the initial request, and be able to follow the gist of likely replies. He will always need to understand more than he can speak, so it is a good idea to use a section of the programmes to develop his powers of comprehension. For example, a linguistic activity like asking the way needs only minimal language for the request, but recognition of considerable vocabulary for the reply.

Understanding and making oneself understood are much more important then being grammatically perfect, and it is better to spend television time teaching basic structures and vital vocabulary than in practising genders, correct verb endings, etc. It is always difficult to teach grammar on television, and in a language like German where even the early stages are full of case endings inessential to survival, it can only discourage the businessman or tourist from any effort to master the language.

These basic structures should ideally be taught in a "real" situation. There are various ways of doing this, and it is here that the entertainment stimulus can be introduced. All the attention-gaining elements of romance, mystery and other soap-opera situations can be exploited to the full in an educationally viable context. Linguistic activities can be carefully woven into the above themes, or presented by attractive foreigners, so that the viewer is carried from programme to programme as much by the entertainment value as by his original motivation to learn the language.

Alternatively, documentary-style real life situations can be filmed in the country, giving the student first-hand cultural information, and stimulating his desire to visit the place for himself. This is particularly useful as it presents the language as it is actually spoken, and the loss of the drama interest is replaced by the documentary interest of seeing how people live, eat, shop, work, etc. —topics which become more and more relevant with the growing migrancy of workers and businessman.

Filming of this sort is practically very difficult to set up. On an ETV budget, one cannot afford to stop trade or activity in any particular location. A favourably disposed shop, restaurant or bank rapidly ceases to be co-operative as retakes hold up business—and yet one inevitably needs more retakes with non-professional people (who cannot resist looking into camera), not to speak of repeats of dialogue for close-ups or reverse-angles. One solution is to persuade the tradesman to open up on a Sunday and provide one's own customers.

It is best to be very selective also about the area of the "real people" filmed, for particularly at beginners' level, it would be too difficult to present a wide variety of intonation, dialect or local usage. There is always an area of a country where language use is reasonably standardized. Also, despite the fact that this sort of situation is unscripted, some linguistic control must be maintained. There are obviously many ways of voicing any particular request, but a student need only learn one, so it is necessary to prime participants to some extent, if film is not to be wasted.

Chapter 13

The use of drama in television

Carol Wiseman

Functions of drama

The advantages of dramatized formats in educational television are easily understood. At the in-school level, children have always enjoyed stories and acting out games, and at all levels, role-playing, fantasy and make-believe, identification with and interest in other people's lives are important; a major part of the diet of the mass media in entertainment consists of drama. This kind of popular appeal can certainly be exploited educationally, as it is a means not only of motivating interest, but can also be used to illustrate difficult points or concepts in a more discursive way than direct presentation, to explore the motives behind plain historical facts, to help teach language and language arts, to recreate scenes from literature, or to show and analyse basic issues in social studies.

If this is the case, one might ask why educational media producers do not dramatize far more of their output?

First, of course, not all subjects are suited to such treatment—they may be better illustrated by documentary filming or animation or studio experiments or graphics. Secondly, if dramatized television is bad, it is awful. It requires not only a good producer—it needs imaginative and skilful scripting, designing, acting and directing. Not all educational services are equipped to provide all or any of these. But the two most influential factors governing the potential of drama are time and money. Drama is expensive and requires careful planning, and like any other relatively costly item such as animation or location filming, it can only form a small part of total educational output. It is important to be selective. It is, however, equally important not to be totally disheartened by cost. By being realistic about what can be afforded right from the outset, and planning sensibly within those limitations—above all, not being over-ambitious (a very real temptation the moment one becomes involved in this field), it is very possible to produce imaginative and effective, relatively "low-cost" dramatization, sometimes in unexpected areas.

This chapter is divided into two sections—on drama and dramatized inserts. The difference can be compared to that between a painting and a sketch. A drama is a play which is complete in itself, whether or not it is serialized, and contains the essential dramatic elements of emotion or conflict in human relations. Educationally, it might well illustrate history or literature, social problems or teach a language. However, the cost of an entire drama programme will probably be prohibitive within most educational budgets, particularly in an historical context where a period setting is used. The dramatized insert, on the other hand, can in many ways be termed "drama on the cheap". As with a play, the enacting of a situation can bring life and interest to a subject, but since inserts are shorter, less complete, more flexible, cheaper and altogether easier to produce, they can offer a very viable technique for educational television.

Specific programme areas

Pre-school and younger primary

At this age-level, the term "drama" can be used loosely to cover any story told in terms of characters and dialogue. The most successful situations are those which are familiar to children through their daily lives or their knowledge of story-books; the most popular characters, children like themselves, easily identifiable adults, fairy-tale figures who are exaggeratedly good or bad and, of course, animals. One of the delights of producing drama for young children is that they are unsophisticated in their technical demands and can be as delighted with puppet figures (glove, finger, shadow, strings, etc.) as with actors. Production can therefore be much simpler, and cheaper.

However, young children also become rapidly bored and the over-all duration of a programme is probably less important than the length of its component parts. Three to four minutes is a good basic length for any item and a constant shift of pace, style, emphasis and technique is essential. A dramatized story will therefore fit very happily into most programmes for young children and provide the necessary light relief from more direct instruction, perhaps be linked to it and therefore stimulate interest. One series for 6-year olds used a format of programmes in sets of three—a story programme with two linked, more directly instructional programmes, with the budget shared between the three. For example, one set consisted of a dramatization (with actors) of *Hansel and Gretel,* followed by programmes on woodland life and sweet-making (containing elements like library film, a live animal in the studio, location film of a sweet factory, a studio cookery demonstration). The drama programme in fact lasted 15 minutes, but still fulfilled the "3-to-4-minute-an-item" principle in that each scene was no more than that individually. The drama programme had many advantages educationally, as it not only pinpointed interest on woodland life (the children would have identified with Hansel and Gretel and imagined they were themselves lost in a wood) and on sweets (the witch's house being made of all sorts of candy), but it inspired creative thought and writing, mime and drama, drawing and modelling, and psychologically it played out a common fear (being alone in a dark place) in a group context. Drama has particular benefits for the shy child, as it asks for a passive rather than an active response and enables him to forget his own self-consciousness by identifiying with other characters. It also helps the rebellious child as it is not a voice of authority; it can convey its message much more subtly. Take for example a programme teaching simple hygiene. There is always the direct instructional approach from a teacher/presenter with demonstrations of how to was your hands, comb your hair, etc., but this may make some children bored or rebellious. On the other hand, a dramatized, fictitious tale of what happened to "the boy who didn't wash his hands" or (using the ever-popular image) to the "rabbit who wouldn't clean his teeth", can both fascinate and make a child subconsciously aware of the lesson.

Older primary and secondary

A main use of drama is in foreign language teaching (cf. Chapter 2). But there are many other possible applications, including native tongue. Again, because of its inherent interest value, drama will make pupils try hard to understand and therefore increase their facility of speech and vocabulary. A very successful series entitled "Look and Read" for backward readers was based on a drama serialization inserted into a presenter-linked programme. The drama was entirely on film to avoid studio costs, and contained all the elements guaranteed to enthral a child—space-ships, children getting deep into danger-fraught situations and winning through, and "cliff-hanger" endings each week to maintain excitement. At the same time, the script was carefully based on planned word counts and patterns and selected vocabulary for pronunciation and reading practice, and the teaching sections borrowed many images from the story to enliven the direct instruction, as for example the insertion of words for reading practice into a monitor in a "space-machine", and using a mirror to decipher the "space-language"—(a mirror image of our own).

History and literature

The benefits of drama in enlivening history teaching are obvious, but the problem is how to cope with the cost. Period costumes, make-up, sets and props, also perhaps film locations free of any signs of modern living, can put an impossible strain on the time and budget of the ETV producer. Dramatic productions of great works of literature create similar problems, although present-day settings should ease the situation. The main problem is that in both these subject areas, characters, sets and plots are imposed on the producer—not his own selection in direct relation to budget.

It is quite possible, however, for a producer to be selective about which scenes within a particular topic might be dramatized, and to blend these drama inserts with other forms of ETV. Often the most successful drama on television is the close study of a small number of characters, and this admirably applies to the motivation and plotting which led up to major events in history, leaving graphics, etc., to illustrate the particular battle or conflict concerned. Equally, drama inserts can spotlight scenes of particular importance from literature, thereby inspiring interest, understanding and further reading.

Mathematics

This is not, at first sight, a subject area where one would expect to find dramatization. But if used carefully, the drama element not only appeals in its own right but can also give a clearly understandable, and domestically applied, interpretation of a mathematical topic.

For example, the concept of averages was illustrated in one programme by a scene written around a motor-bike, "gues-the-mileage" competition in which the teenagers take part and experiment themselves with mathematical possibilities.

Surveys become significant when Kathy goes into the statistics of the provision of places in nursery schools to help a neighbour. And computers are explained in relation to a scene about computer dating.

It is interesting to note that the feedback from this series showed an overwhelming preference on the part of the pupils for the dramatized programmes. With a little thought, many mathematical topics can be related to domestic situations, and as they need probably little more than present-day, basic sets, straightforward acting and relatively few characters, a tight control can be maintained on the budget.

Other sciences

In general, science is best illustrated by film (with special close-up work, high or slow-speed photography), studio demonstrations and experiments, etc. However, dramatized programmes can cover early experiments (e.g. with oxygen, electricity, pasteurization and the microscope); the inserts can be historically based on the work of the original well-known scientists in these fields. The reason for such dramatization is not just interest in the re-creation of the past, but also an attempt to equate the limited knowledge of the adult scientist in the year of these discoveries with the similarly limited knowledge of a child, but with modern equipment. The child will hopefully be inspired and encouraged to do further experiments and make discoveries for himself.

It is easy to see how many other science-based programmes—for instance caring for animals, sickness in human beings, making apparatus like a radio receiver, might well gain from the use of drama inserts.

Other areas

A list of programme areas where dramatization could prove useful does not, of course, end with the above. Social programmes can bring compelling reality to much of the sadness and problems of our society—old people, housing, broken homes, etc.—by a drama/documentary technique. Geography can re-create foreign ways of living. Careers programmes can dramatize the problems facing the undecided teenager. There are, in fact, few classroom areas where dramatization will not only enliven and guarantee interest, but also clarify, and make real, many aspects of the subject.

Adult education

The situation with post-school ETV is slightly different. The audience is not captive but willing; dramatization is therefore on the whole rarer in an adult context, except where it plays a role additional to a purely interest-gaining function. Language programmes have been discussed in a separate chapter, but business and management series also lend themselves particularly well to the technique. The office situation, the problems of setting up or expanding a firm, with all the necessary decisions, interviews and discussions with staff are all potential dramatic material. Drama is useful for teaching adults in any social, psychological or communication context as they can identify with characters and see themselves as if in a mirror. It can therefore help in a very unassertive way to prevent or adjust mistaken ways of thinking.

In almost every case, inserts will be more practical than full drama programmes in ETV for adults. With their strong motivation for viewing, they can accept and often expect explanations and presenter figures. However, from their mainstream viewing of drama programmes, adults will expect a high degree of professionalism and the producer of ETV drama must endeavour to reach such standards.

Production techniques

Planning

Let us assume that a producer in a series has decided to use drama or dramatized inserts in x number of programmes; the first points he must consider are staffing, budgeting and scheduling.

Staffing

Unless the producer is himself competent in this field, he will need a relatively experienced director/P.A. to assist with casting, interpret the script visually, take rehearsals, be in charge of any filming and direct in the studio. He will also need an Assistant Floor Manager (AFM) who will look after all props, mark up and help in the rehearsal room, arrange calls for artists, etc. He should select a good script-writer (probably free-lance) who can write interesting, natural dialogue suitable for the target audience. The services of a costume and a make-up supervisor will also be required, even if artists are wearing their own clothes, and the producer must decide how much time they will need to spend on the production.

Costing

The spinal centre of most decisions is the budget. The number of characters and sets, the length, whether or not prefilming is possible, relate directly to available resources, so that crucial to the whole issue are the early discussions with the script-writer. He must be aware of all limitations before he starts including crowd scenes, or battlefields, or stately homes. The designer should also be involved at this stage as he can advise on cost and availability of material for sets.

A drama budget will be weighted differently from other ETV budgets, being heavier on artists' fees and design and property costs, probably on costume and make-up (though these can be kept minimal) and copyright (the script-writer); on the other hand, graphics are likely to cost considerably less, and film costs to be non-existent. Location filming to any large extent is a luxury (except where it totally replaces studio drama) and the saving on film costs is often essential to make drama a viable proposition at all. It is important not to skimp on artists (and tempting when funds are low); it is better to spend more than a fair share of the available finance on artists and the script-writer than on scenic servicing.

Scheduling

Preparation time, of course, depends on the length and complexity of the dramatization, but it is important to have a reasonably finalized plan and script well in time to audition and cast, find and set up film locations (if necessary), plan rehearsals and order props, graphics, costume, make-up, etc., in time for the station's deadline requirements. Film scheduling is less flexible than in other programmes. To avoid paying retainer fees on artists, or simply because they may not be available otherwise, it is best to film just before the start of rehearsals (which enables film to be played into the studio recording but means film editing will be rushed and done at particularly busy times), or immediately after the studio recording day (which helps with film editing, but also involves a transfer from film to videotape, and technically it makes "matching" difficult for sound, lighting, costume and make-up continuity if exterior scenes run directly into interior or vice versa). Rehearsal time depends again on time and complexity, but a rough guide would be five days rehearsal followed by a sixth day in the studio for approximately 25 to 30 minutes transmission length. (This breaks down roughly into a day's rehearsal per 5-minute scene.)

If a term's programmes contain several short drama inserts involving the same characters, it may be a good plan to rehearse and record all of these together. One can then be sure of the availability of artists, avoid the danger of any retainer fee, work with the same technical staff and possibly achieve better results in a more compact schedule.

Preparation

Other chapters of this book have dealt with programme preparation in detail. However, some useful points can be made relating specifically to drama production in roughly chronological order.

The studio set

Make sure the basic shape of the set enables sufficient camera coverage. In a deep three-sided set, do not necessarily restrict camera positions to the imaginary "fourth wall" area; if there is a fair amount of movement on the part of the artists, it may be difficult to achieve good eyelines. Remember that doors can be opened, window curtains drawn back and large pictures can conceal "camera traps". Check on floor coverings—carpeting restricts camera tracking, and small rugs are much more flexible and easily removable by the floor manager. Beware of painted floors if liquid is to be poured directly above them. If any is spilt, the paint immediately becomes slippery and a very credible parquet is rapidly transformed into a muddy blur.

Filming

Remember that costume, make-up and artists mean that more people need to be fed and more vehicles parked (time can be saved by prior arrangements). However, delegate as much of the planning and organization as possible to an assistant. The shooting order for drama filming might be altered from what would most suit the crew by the necessity of costume or make-up changes or of shooting all of one artist's scenes on one day. (Try not to pay for more "waiting time" than you can help.) Plan any really complicated costume or make-up either for the start of the day or directly after a meal break, so that the crew will not be kept waiting. Careful scheduling saves time and money, and good relations with crews are most important.

The planning meeting

All dramatized productions (unless they are very simple and short) should have a "technical run" two or three days before the studio recording, where the technicians can see exactly what happens in relation to the completed camera plan. All that is needed at the earlier planning stage is: (a) a floor plan (most of the arguments will be between the designer and lighting supervisor over the barrels); (b) the main lighting condition repositioning of the set in relation to lighting quired for each scene. Remember that lighting effects can often replace expensive pieces of set-furniture, a fireplace with an open fire can be avoided by a fire-flicker and glow effect; (c) a rough idea of the action; (d) technical requirements regarding cameras; (e) what sound coverage is required (the Sound Supervisor will be anxious to know how far apart characters will be when talking), including the number of gramophones and tape effects; (f) details of any particular matches from film to studio, and a promise that technical staff will see the film early in the studio day.

The rehearsal period

Hold all rehearsals in the same room. The AFM can then mark-up with tape on the floor the exact position of the set and put out main pieces of furniture. If the room is too small, he can mark one set over another using different coloured tape.

It is customary to hold a read-through on the first morning of rehearsals, so that both director and actors can get an idea of how they are interpreting their roles, before planning any moves. Invite the costume and make-up supervisors so that they can meet the artists and briefly talk to them about fittings, take any measurements, etc.

Work through the moves which you have roughly planned. Never give an artist a move which is not justified by the action; if he is really unhappy it is better to adjust the shot you have in mind, or you will only achieve an uncomfortable performance at this point. Keep your artists aware of problems you foresee in the studio—i.e. big close-ups where they must keep particularly still, "cheating to camera" in conversations, not moving too near the backing flat for lighting reasons.

Remember that rugs and furniture can be moved or repositioned with little difficulty. Realize the full potential of available space for cameras.

If any props are likely to prove awkward to handle, make sure that the AFM provides the real thing for rehearsals. There is nothing more likely to upset an actor than a toy pistol provided for rehearsal turning into a double-barrelled shot-gun on the day. Equally, beware of rehearsal furniture. Many a sofa grows (or shrinks) alarmingly in the studio, upsetting actors and shots alike.

The camera script

Once the moves are fairly set, start writing the camera script, bearing in mind the age-group for which the dramatization is intended. Particularly for younger age groups, unobtrusive, clear shots are usually most successful, except of course where a special effect is required (perhaps to convey menace and danger, when low angles, slow pans, quick zooms can all contribute to the atmosphere). If there are several sets, a less-experienced director will be well advised to work with circles of card representing cameras on the floor plan, and attach them with string and a clip to the cabling point. This avoids cable crossing, and enables you to see at a glance where all your cameras are positioned.

Studio time is very restricted. If there are a lot of major costume and make-up changes, or if action jumps constantly between sets, record out of order (everything in one costume, or everything in one set).

The technical run

The camera script should be completed by this stage, at least in a rough form, so that any precise questions can be answered about what shots are being taken from which angles. The camera plan should be available for distribution, also a "running order" (a schedule giving a breakdown of camera positions, lighting effects, sound coverage, etc., used in each scene).

Hold the technical run entirely for the technicians and warn actors that this is the intention. Stop whenever there is a problem; it is usually best to have discussions at the end of each scene. Indicate where there are recording breaks or pauses.

The studio day

Arrive early. Despite all your scrutinizing of the plan and care with furniture, something will look different from what was expected. Double check on all possible shoot-off points and make a mental note of where changes may be required.

Stagger each section of the script, and however behind schedule you are, run it through, before you continue. This is time-saving in the long run, as it fixes the shots in everyone's mind and may actually prove more useful than runs of the whole play.

Listen to suggestions from the cameramen. They are most probably improvements.

Try to remember to stand artists down when you know you will not need them for a time; they will be grateful for a break, or make-up may well need them.

Give any vital notes to artists through the floor manager; give performance notes personally in the first break possible. It is very easy to become absorbed with technical problems, but necessary to watch actors' performances as well. See all the artists before the actual recording to give them any final notes and wish them luck.

If in the recording a scene goes well technically, but you feel that performances could have been better, ignore technicians, tests, and retake the scene.

The non-directing producer

Most of the above points are the director's responsibility, but a producer should also be aware of them. With a competent director, a producer need only attend the first and last rehearsals, and perhaps one other. The director should, of course, always be grateful for second opinions on casting and on all his artistic decisions. The producer, being the educationalist, can also ensure that both director and actors are sufficiently aware of points which are going to be picked up educationally in another part of the programme or programmes.

On the studio day, the producer should try not to undermine the authority of the director. If he genuinely wants a two-shot replaced by a close-up, it is better to whisper this to the director privately and let him tell the crew himself. Since the director will be chiefly concerned with technical matters, the producer can concentrate on general pace, rhythm and performance, and may well pick-up what the director misses.

Chapter 14

Current affairs and documentary programmes

John Miller

Current affairs programmes are a major part of the output of any broadcasting organization but they have a separate place in educational radio and television. In this field the producer often faces a special set of problems.

In the first place, he is producing highly topical programmes, which may depend upon last-minute shooting and recording, and upon information and events which are unpredictable, but he is doing so in an educational environment where great emphasis is laid on pre-planning, on the advance production of support materials, and on advising teachers at an early stage of programme contents. He has therefore to find a workable compromise between the two positions.

Secondly, his output is likely to be compared directly with equivalent productions in the general stream of programming, since subject matter and presentation may be similar, but at the same time he is likely to be working with far fewer resources at his disposal. Moreover, because his programmes are destined for educational audiences, he will often be required to develop his themes more fully and more methodically than would necessarily be the case with comparable general productions. Again, he has to find ways of overcoming this disability without losing the interest of his audience, and a good deal of ingenuity is called for.

In many ways, therefore, the position of the producer working in this field is very different from that of other educational producers. They will be working to a carefully planned schedule, which involves a routine of scripting, pre-filming, outside rehearsal and recording. The current affairs producer has to create his own routine, and this must allow him to deploy his resources logically, while not committing himself too precisely in advance on theme or subject matter.

The current-affairs producer needs to know three things before he can begin to plan his programmes—first, the audience he is aiming at, second, the time-scale within which he has to work, and third, the budget and resources he can call upon. He might want to use only film, or he might have to use an electronic studio; he might have a team of people to help him or he might be on his own. All these constraints or assets will govern his choice of both subject and treatment. As an example, we can take a 20-minute BBC programme, produced live from the studio, once a week, for 13- to 15-year olds. It sought to explain the background to one of the main issues of the day, using film inserts specially shot or drawn from the film library, and a wealth of studio illustrations—maps, animated graphics, models, photographic captions—all linked by one presenter who narrated the programme. The producer in over-all charge had a couple of assistant producers, so that each of them produced a programme about once every three weeks.

This strike-rate dictated the production schedule. In the first week the producer worked out a synopsis, viewed film for selection of sequences, dispatched these to the laboratories for duping, asked the photographic library for a selection of photographs, requisitioned maps and lettered captions, researched the subject for the details and shape of the script, and talked to possible presenters and consultants.

The second week was spent mostly in the film-cutting room editing film, with further work on the script and studio requirements. This was when the planning meeting was normally held.

The third week saw the writing and dubbing of the film commentary, the writing of the camera script and final preparation of everything for the studio.

The three-week schedule was sometimes compressed into two weeks by the pressure of events, and on one tragic occasion into five days by the sudden assassination of President Kennedy. But normally the series was trying to predict every week what would develop into the main issue in the news in three weeks' time. More than half of the programmes looked at foreign events—wars, revolutions, elections, space-shots, and stories of development—and both budget and time restrictions precluded special filming. But national events, such as elections, budgets, the introduction of a new coinage or the growth of provincial theatre, could be decided on far enough in advance to send a director on location with a film crew.

The important lesson about producing this series, however, concerns not technique but content. In such situations the producer has to research and write the script, and a programme is only as good as its script. For a school audience it is necessary to condense and simplify what can often be a very complicated situation—and it is essential that nothing crucial gets lost in the condensation process.

It would be poor education if it did, but, in addition, politics is a sensitive area of study, and specialized and vested interests are quick to complain about anything they regard as distortion. One insurance is to employ an acknowledged expert as consultant, to read the script at every stage and make comments on detail and the over-all balance.

One-off programmes produced live on topical issues have their own production problems; linked series face different ones. The great advantage of planning a series over a period of several months is that the producer has time to read and consult more widely and to write an accompanying pamphlet for teachers, pupils or both. The written material can then carry much of the factual background and the programmes can discuss the issues. For younger children, interview material is usually unsuitable, but in series produced for higher forms and colleges there is an opportunity to introduce them to decision-takers in various fields. In one such series, presidents, prime ministers, heads of United Nations Agencies were interviewed at length on film, with the producer working in close collaboration with writer-presenters. First there were detailed discussions on the shape of the programmes, and a list of potential interviewees was drawn up. When the film sequences were edited, and agreed, the producer sent a shot list to the presenter with a synopsis of the commentary and the studio links. The presenter then wrote a detailed script which the producer rewrote into a film dubbing script and a camera script. The two then sat down together and hammered out a final script which genuinely reflected both their talents.

This kind of interchange of ideas and language depends on a mutual sympathy and respect that cannot be taken for granted, but must be built up over the period of the working relationship. It partly explains why many producers work again and again with the same performers whose work they know and admire.

Programme-making always needs to be put in the context of the audience. When a BBC producer took over a general studies series for students in further education, he first went to meet the audience—largely day-release apprentices, typists, with some block-release students, in technical colleges. They had just left school and begun work, had few examination qualifications, and very definitely did not want to be treated as if they were still at school. Foreign affairs held little interest for them, and they had a very sceptical view of anyone in authority, be he prime minister, college principal, or visiting producer.

The producer wanted to begin by producing three programmes on marriage, so chose contributors of the same age group and general background as the audience. These programmes consisted almost entirely of talking heads, with the young contributors telling their personal stories and attitudes to the institution of marriage. Such a format can lead (and led) to extremely lively discussions after the broadcast.

If the subject catches the imagination and interest of the audience the programme can hardly fail; if it does not no amount of production technique will save it.

All the programmes mentioned so far have been carefully scripted and structured. It is sometimes thought that apparently unstructured, unscripted studio discussions, interviews and debates are easier to produce. But nothing could be further from the truth. Preparation has to be even more meticulous. When John Kenneth Galbraith, the distinguished American economist and political adviser, was resident in England for a few months it was decided that he should be cross-examined by a group of students in the studio. A research assistant visited a large number of schools in the London area to select a good cross-section of the brightest pupils available, and brought the five selected to the studios a couple of weeks beforehand. They all had a number of questions, and had read a certain amount of Professor Galbraith's writings. The producer spent a couple of hours working out the shape of the programme with them, the order of the questions, possible supplementaries, and who was going to ask what. Everyone was given a profile of the professor's life and thought, and advised to read one of his latest books. The producer had a couple of meetings with the chairman, a professional broadcaster, and on the day of the recording he and the pupils met and talked for an hour in the studio while the director worked with cameras around them.

By the time the professor arrived most of their studio nerves had been dissipated. The participants and production team then broke for dinner and talked largely of other matters, to break the ice between the public man and his young interrogators. The former only knew the general area of discussion, not the detailed questions. To help control the duration of each part of the discussion, the director could talk directly into the chairman's earpiece, or "deaf-aid", to indicate that it was time to move on or communicate how much time was left. But the success of the programme depended on whether the questioners could rise to the occasion and warm to the argument as it developed. An insistence that they do their homework, with an example by doing some of it for them, gave them the necessary confidence to challenge this eminent professor with a reputation for crushing uninformed journalists. Galbraith himself said afterwards that he had not often been questioned in this way on television and had enjoyed the experience immensely.

A variant on the studio confrontation is the forensic debate under the format of a "mock trial", with the verdict left to the viewing audience. The case for the prosecution can be put in one programme and that for the defence in a second. Each counsel needs to rehearse his opening and closing statements and to brief his three witnesses, but obviously does not want to give anything away to his opponent. One series of these *Your Verdict* programmes was produced by two producers, one looking after the prosecution team while the other worked with the team for the defence. All the contributors simply walked through their entrances and exits, and answered a few questions on a totally unrelated topic to give the crew the necessary camera rehearsal. This kind of presentation has the advantage of involving audiences very directly in the programme and inviting them to make a personal judgement.

Producers sometimes make the mistake of thinking that if the discussion is unscripted they cannot or need not have a camera rehearsal. But for a 25-minute programme one normally needs about an hour with cameras, to rehearse the opening and closing routines and the cutting formula in the as-directed sequence. This means that basic shots must be identified, set up and rehearsed, so that even though their final order is unknown, they can be found and framed quickly by cameramen. If this procedure is not planned properly, a quick verbal interchange can take place without the camera ever being on the speaker until too late. Directors can only think on their feet if they have planned their shots to make sure that the cameras are always pointing in the right direction. For most of the studio programmes discussed above, four cameras were used, but even with only two cameras one can still shoot a discussion between four or five people, with close-upsas well as group shots.

The current affairs ETV producer inevitably develops different habits from his colleagues in the fields of mathematics, science or languages. The same disciplines of clarity of outline and simplicity of language apply, but whereas the other specialists frequently use teachers or ex-teachers as presenters, especially in developing countries, this is rarely the solution for current affairs. The knowledge, expertise and authority brought to the screen by professional broadcasters and journalists are intangible qualities that educational audiences are quick to appreciate. Schools and colleges want to see and hear the men and women who shape events, and they want as commentators individuals who have observed these events on the spot. (One attraction of working in this field is that one rarely finds anyone in public life reluctant to communicate to this most important audience.)

The producer must be deeply interested in and knowledgeable about the whole field of politics and international affairs. He must be able to select the best subjects from the hundreds of options open to him, the best people to work with, and know the most effective and illuminating way of conveying the essence of the story to his audience. He has to succeed in not just telling what has happened, or is about to happen, but to explain why as well. He must always have the ability to shift into top gear when events overtake his programme; a capacity for improvisation is essential.

Finally, if he is going to succeed in his task he needs a dependable team of assistants to whom he can confidently delegate, and a supervisor who will support him through any political storm that may break around his head because of one of his programmes.

Chapter 15

Closed-circuit television

Hugh Williams
George Klein
Peter Coltman

Functions of closed-circuit television (CCTV)

The essential feature of CCTV lies in its method of distribution, which is by cable, by microwave transmitter and receiver, by the physical transportation of videotape or by a combination of these means. It therefore differs from open-circuit or broadcast television, which is transmitted over a wide area to many viewers.

While the actual material produced for CCTV may not always be visibly distinguishable in terms of production expertise from broadcast material, because of the "closed" nature of the system, there is usually a greater possibility for its viewers to influence content and methods. This influence may be direct or indirect, but it enables the content to be more specifically oriented towards the needs of the known learners. Equally important, the method of utilization of the material can be incorporated into production planning.

Again, there may be no distinction between broadcast and closed-circuit television based on the size of the producing organization or the extent of the facilities available to it. For example, a city, such as London, may have every state-maintained school, college, and university linked by CCTV to extensive studio accommodation which compares favourably with that at the disposal of many a developing country. At the other end of the scale, a single school in South-East Asia may have a simple but effective installation, consisting of a camera and a viewing monitor.

Clearly, therefore, the term "closed-circuit-television" represents a wide range of levels of installation from the simple to the lavish, and administrators and producers often experience difficulty in assessing the scale on which their operation needs to be conducted.

There are numerous instances, in many parts of the world, where extensive closed-circuit facilities are underused or unused or misused because of an inadequate understanding of what closed-circuit ETV can do and the most effective and economical way of doing it.

Some pitfalls

First, CCTV does not claim to solve every educational problem, nor is it capable of doing so. It is able to assist in certain ways in meeting specific educational objectives, but these objectives need to be stated in very clear terms and examined carefully. It may be that a medium other than television, although less prestigious, may be more effective in meeting them at lower cost. Alternatively, a changed organizational pattern may achieve the same results; television is one medium among many available to the teacher.

Many educational institutions have embarked on the use of CCTV as a means of reaching overflow student audiences. A lecturer, either in a studio or a lecture room, talks in front of a camera and a microphone to students in other areas. Acceptance by the students is low. They become bored and restless because they are looking at a talking head in black and white on a small screen for an hour or more and because they see no justification for using a visual medium. Nor are they impressed when the lecturer writes on the blackboard in bad calligraphy which is too small for them to read.

Academics may be quick to defend this situation. They can reply, with justification, that technology is not misapplied if it is not fully exploited at all times. A car can be driven at less than top speed, a stove can cook less than a gourmet dinner, but in the overflow lecture situation, it may well have been cheaper and more effective to overcome the problem of large student enrolments without the use of television. This might be done by repeating the lecture (changing the organizational pattern) or by using an audio public-address system supplemented by duplicated sheets of paper bearing diagrams, equations or other visual material which individual students can see clearly and to which they are directed by the lecturer (changing the medium).

Secondly, CCTV is, by itself, unable to improve the quality of the educational material which it is asked to distribute. The quality of the output is directly related to the quality of the material which is placed before the camera and microphone.

Allied to this is the equally erroneous supposition that CCTV can always save the lecturer time which he can then devote to tutorial work or to research. In fact, the planning of effective CCTV material, possibly involving film, photography, previously recorded videotape and the incorporation of graphics material, is vastly time-consuming; it may be very effective in what it sets out to do, but it certainly does not save time.

Again, television, if it involves the presentation of complex material, demands team work. The range of skills available to assist the lecturer in even a modest unit may include those of a producer or media specialist, graphics designer, photographer and television engineer. But traditionally, the teacher is accustomed to presenting his own material in his own way within the four walls of his classroom. He may not always take kindly to the suggestions of others, however well intentioned. Media people may despair at the entrenched lecturer who ignores the potentialities of the medium and insists on trying to proceed with something they know from previous experience will not succeed. Differences in personality may lead to mutual disillusionment.

Then there is the television screen itself, which is small and incapable of presenting complex diagrams and numerous words and figures to large numbers of viewers. There are, of course, ways of overcoming this problem, such as simplification of the visuals or the distribution to students of hand-outs bearing the more complicated information, but CCTV material is produced daily which ignores the limitations of size, absence of colour and low resolution of information inherent in the monochrome television screen and which lead to frustration on the part of student audiences.

Planning for CCTV

The context in which the college or university producer works therefore poses problems which are not matched in other ETV situations. The process by which a television programme or film is made in a university begins when the university teacher feels the need for such a programme; this may be prompted by some recognized gap or deficiency in a specific area of a course, or by a particular crisis in the teaching system, or by something as vague as the desire to make a film or television programme—or by all three. What is clear is that this innovation is not always linked to a general appraisal of the course, although it may in time lead to it. In very few situations does there appear to be a systematic approach to the choice of educational media in teaching; television is often added on to the existing structure and therefore not always attached appropriately.

However, once the lecturer has decided that he wants to make a programme and has indicated its viability within his teaching, what happens? It is difficult to generalize because of the variety of work undertaken by a CCTV service, but it will include, for example, observation work done on a single camera (such as in a laboratory), which will require no production expertise; observation of a more sophisticated kind at the hospital bed or in the psychiatric ward; recordings of experiments or demonstrations as illustrative episodes within the lecture; recordings which are designed to replace the lecturer; recordings which are designed to provide source material for teaching; recordings which teach directly. The one point which all of these, except perhaps the observation recordings, have in common, is that they have a limited life span. It is ironical that the one feature of television which almost all teachers will accept as a virtue—its ability to package and store material—has only a limited usefulness. Apart from rapid technical innovations within the CCTV world which quickly date equipment and therefore recordings too, a programme which requires any degree of presentation or interpretation of material will need to be updated at regular intervals. Not only does this offer opportunities to modify the content and incorporate changes as a result of the audience response, but it also gives the lecturer a chance to escape the sheer boredom which inevitably comes from the regular use of any piece of packaged material. This must be made clear right at the beginning, otherwise the lecturer may feel cheated when he discovers that his work is not necessarily to be preserved for posterity!

The next problem is to decide what the finished programme should look like. If this seems somewhat premature, we should remind ourselves that both lecturers and producers are likely to have stereotyped ideas about programme style which probably derive from broadcast television and may be quite inappropriate. The style of a programme—and indeed the word "programme" may be wrong in this context—derives from its content, its objectives, the size and level of its target audience and the resources available for its construction.

Of course, it is true that teaching, as a from of communication, is a performance, the success of which depends upon the performer's ability to master the techniques of the medium within which the performance takes place—and this is as true of television as it is of lecturing or conducting a seminar. But the technique has to be subservient; it has to be mastered, or else the performance is reduced purely to a display of technique (or the lack of it). "Television standards" are important, but only if we remember what they are seeking to maintain. A high technical standard, for example, exists only in order that we may see and hear recordings clearly whenever they are replayed. It is a matter of judgement, not of comparison, whether these standards can be compromised. In the case of most CCTV units, a technical standard which costs a great deal less money than that maintained by the broadcasters has been judged acceptable. It would be surprising if CCTV did not also develop different production standards, which may be equally acceptable.

So the producer is unlikely to be able to predict any fixed pattern for his work. He must begin by finding out the subject area to be covered by the programme, the context in which it will be seen, the immediate audience who will view it and any spin-off audience (which may, for example, include students from other institutions). On this information, he will take certain decisions. The subject-matter will govern the means (a tape/slide production, for example, is cheaper than television and may be more appropriate), as may the audience (if a wide foreign distribution is expected, film is easier to handle and has universal standards). The context in which the programme will be used will govern the teaching approach, and it is at this stage that the lecturer may begin to appraise his whole teaching effort. Time should be allowed for him to re-think his contribution, once he appreciates the limits, and specification of what he is doing.

When this has been done, the preparation for the programme begins. Often, the producer's most difficult task is to persuade the lecturer of the amount of preparation that may be necessary. But preparation is not merely a routine; it is a valuable discipline. It is only when one comes to script what one wants to say that one realizes how much may be only partially relevant. CCTV does not have the same time restrictions as broadcast television, but it does have the same effect of making its users concise. Likewise, the discipline of deciding what images to use to make a particular point forces one to examine that point afresh. For this reason, lecturers should be persuaded to script whatever they are going to do; often, particularly on large projects like films, it can be a lengthy process covering several months and involving a great deal of discussion. In fact, it may be the most time-consuming part of the entire venture. But it is seldom time wasted, for it allows one to be sure that what will be expensively committed to television or film is what is actually wanted. After this, the preparation of materials takes place; again the lecturer must be involved at every stage in the process because he is the expert and he needs to check all that is going on. It is very easy in highly technical subjects for errors to occur in graphics, for example, where the artist himself will not necessarily understand the subject matter.

However, once in the studio, the expert becomes the amateur, and it is a matter for debate as to how much the process of rehearsal and recording should be modified to suit him. Some take more readily to television presentation than others and it seems sensible that, for the less able, routines and conventions should be relaxed as far as is compatible with the maintenance of the programme standard. For example, some people have great difficulty in memorizing words, even their own, and staunch attempts to do so may produce unnatural, wooden performances which will delight but not instruct the student audience. As far as possible, the producer should solve this problem in anticipation. Some sections of the script (e.g. studio animations) will have vision and sound tightly linked, but in other places it may be possible for the teacher to talk *ad lib*, providing he can remember the visual sequence of the programme. If a producer is fortunate in his cameramen, he may be able to record long sequences without any script at all. It is a matter of judgement as to when this style adversely affects the conciseness of a programme. Almost certainly, the commentary for the film sequence will be pre-recorded; again, if the teacher has difficulty in talking and demonstrating at the same time, he may use a second demonstrator, or alternatively, if the demonstration takes place in close-up, pre-record its commentary. Technical innovations of various kinds have meant that some of the disciplines of television presentation can be avoided; if the teacher finds it easier to record small sections at a time, sophisticated VTR editing makes it possible for him to do so. The only criterion is that, in the completed production, the teacher should appear to be exploiting the television medium to his own ends and not vice versa.

Some case studies

These, then, are some of the commoner pitfalls which can contribute to a less than effective use of the medium of CCTV, and some of the ways in which the demands of the medium can sometimes be relaxed, in the non-specific environment of the closed-circuit installation. Yet the fact remains that CCTV can assist in well-defined ways in meeting educational objectives both inside and between academic institutions. For the rest of this chapter a variety of CCTV applications are described in the form of case-studies, incorporating details of the production planning which they entail and also patterns of utilization, especially where these affect the planning of the material. The simpler forms are taken first.

CCTV as an (audio) visual aid

This represents a simple but often very effective use of the medium.

Case study 1

An engineering lecturer in a college wants to show, in the course of his lecture, the operation of a machine in a workshop elsewhere in the college. Rather than interrupt his lecture to take the students to the workshop, where he would be inaudible over the noise of the machine, he uses a short CCTV insert to the lecture.

Production. This is minimal, and consists of arranging a camera, operated by a technician, in the workshop so that his students can see the machine in operation, followed by zooming in of the lens to show close-ups of three dials in turn and from which the students are required to take readings. The camera is already showing a wide-angle picture of the machine when he turns on the viewing monitor in the classroom, and the technician is cued to zoom in to the first and subsequent dials by telephone. The sound commentary comes from the lecturer himself, who turns off the set when he has finished and resumes his lecture. He can personally answer questions raised by the students.

Case study 2

A biology teacher in a lower secondary school, which possesses one reasonable microscope, wants to show living protozoa (single-celled animals) to a class of thirty-eight children in order to demonstrate movement and feeding. It would take a long time for the children to line up individually to see the protozoa, and because they appear to move quite rapidly under the magnification involved, the animals would disappear from the field of view and would have to be found by the child, which would take even more time. The teacher borrows a small CCTV camera, a microscope and a 26-in viewing monitor.

Production. This is again minimal. It consists of setting up the equipment beforehand and trying it out. The illumination for the microscope is adjusted to give a suitable brightness for the camera. The children are shown the material, including the effects of adding a thick fluid which slows down the movement of the animals. The picture is in black and white, but it is acceptable in this case. The sound commentary is given "live" by the teacher.

Case study 3

A primary school is desperately short of specialist teachers of mathematics, and is introducing modern mathematics into its curriculum. A teacher who took mathematics at principal level in college and who has recently attended an in-service training course in the teaching of modern mathematics, is reaching a number of classes simultaneously through a small television system bought for the school by a parent/teacher association.

The specialist has a group of children in the classroom, and is teaching them before a small camera manned by the school secretary. The camera is cabled to a monitor in each of three other classrooms, also equipped with loudspeakers which relay the sound picked up by a microphone which the specialist teacher wears around the neck.

Production. The material and its utilization are carefully planned. The non-specialist teachers in the three "receiving" classrooms have been briefed about the lesson, and all the children in the four classrooms have identical materials which they will be asked to handle and make written responses to, on duplicated sheets of paper, also issued in advance. The "cameraman" has been briefed about the close-ups which the camera will be required to show.

The specialist teacher introduces the concepts relating to the lesson, which deals with "sets". The class is questioned and both questions and answers are repeated so that the viewing groups can hear. All the pupils then carry out assignments, supervised by their respective teachers, and fill in the gaps on the duplicated sheets. The technique works well and is used regularly. It incidentally provides the non-specialist teachers with valuable up-dating of ideas. The "production" involved in this case-study differs from those in the first two in that sound is added from the same source as the picture, in that the presentation is more complex and it also involves team-teaching, with the close planning of utilization.

Case study 4

In a teaching hospital, a dental surgeon is showing forty-five students a dental operation on a patient. It would be physically impossible to accommodate all the students in the operating room where he is working, so he is using a television camera. Since the perception of colour is important, the camera and monitor form a single colour chain or system, with the students watching in another building permanently connected by cable to the operating theatre.

Production. A technician operates the camera and follows as closely as possible what the surgeon is doing. The latter occasionally glance at a small black and white monitor near the patient to check that he is not obstructing the camera's field of view with his hands or the instruments. The shots show extreme close-ups. The dental surgeon gives a "live" commentary during the operation, and the room where the students are viewing is also equipped with a microphone. When the operation is finished, the students can question the surgeon, using their microphone which forms part of a "talk-back" system.

The importance of recording

The "audio-visual" applications of television described in the case studies so far are chosen because they illustrate a simple but very effective use of the medium: namely in showing students material which, for various reasons, it would be very difficult to display otherwise. The amount of production expertise involved is not generally very great, but the need for planning, especially of the way in which the material is used, is self-apparent. In each case, the students see the material as it is presented: that is, it is shown "live". The equipment involved is relatively simple, and its operation (as opposed to its maintenance) does not require specially trained staff.

Recording provides a number of advantages from the viewpoint of both production and utilization and it greatly increases the scope of both processes:

If the material is worth while, it can be shown to successive groups of learners on a number of occasions, which justifies the time, effort and expense devoted to its initial production.

Material from far afield (e.g. from schools, industrial plants or ecological environments) can be brought into the educational institution without the cost of buying or renting cable or microwave links or of shooting film.

Any observable behaviour or performance (e.g. playground behaviour, teaching performance or dramatic or athletic skills) can be replayed immediately for analysis or for research purposes.

The lecturer can pre-view precisely what is to be seen by his students before they see it and the attention of learners drawn to specific points in the content.

Non-essential parts of the material can be discarded.

Non-repeatable material or material which is difficult or dangerous to repeat can be preserved.

Banks of recorded material, including off-air recordings, can be built up and drawn upon as required.

The advent upon the technical market of reasonably priced 1-inch, ¾-inch, ½- and even ¼-inch videotape equipment changed the face of CCTV production for educational purposes from about 1965. One example of this change is in the area of micro- and macro-teaching.

Micro-teaching and macro-teaching

The role of television as an educational medium is not confined to assisting teachers to present lesson material. In colleges and universities, television can also be used to help teachers and students improve their teaching skills; television can enable students and staff to see themselves teach a lesson, see good and bad aspects and discuss their mistakes. Teaching can be with small groups using only segments of lessons—so compressing time and helping students to gain an insight into teaching practice. This is the essence of micro-teaching.

Macro-teaching is used to show part of interaction analysis, and to enable a group to see a complete class at work in a teaching/learning situation.

Both micro- and macro-teaching forms are relatively recent developments, which have come to the attention of educators as a result of the significant role that television has assumed in education, and because of the availability of cheaper equipment to allow the introduction of the scheme. All that is required is a television camera, a videotape recorder, a monitor and a microphone. The principle of micro-teaching is that the student/teacher who has previously seen a model of, or an aspect of teaching such as narration, chalkboard skills or questioning, gives a short lesson to a small group of children, and while doing so is recorded on videotape. This requires little technical skill, and ordinary lighting is adequate in most cases. The tape is later replayed in whole or part, so that a discussion may be held on the effectiveness of the lesson and the skill being learned. Generally, only one particular teaching skill will be developed during the short lesson segment given, and after the teacher has had the opportunity to redraft his material, following a critique, he will again present his lesson to another group of children or peers. This will again be videotaped and replayed for further evaluation.

Another of the ways in which this type of teaching can be used, employing a television camera and videotape equipment, is in the "example situation". Here, an experienced teacher will present an ideal lesson, skill or objective, so that it can be replayed to students to give them an example of the correct methods, response or behaviour which are essential for the mastering of that skill. The student can then try a similar pattern of teaching and compare the results.

Case study 5

In a college of education, micro-teaching is regularly used, on a remedial basis, to supplement classroom teaching practice by student teachers. Hitherto, students identified as being "weak" in the course of their second-year teaching practice were given extra teaching in school before their final, third-year practice. This presented serious problems from the point of view of supervision by lecturers and the result was often the re-inforcement of faults by the students during their extra practice.

Micro-teaching underlines the existence of identifiable skills within the teaching process which can be isolated and practised separately. Examples are: organizational skills, questioning technique and the setting of assignments.

The names of twelve students whose specific weaknesses had been identified by their supervisors during the second-year practice are communicated to the education lecturer organizing the micro-teaching, and during the course of the exercise each student, under the guidance of a supervisor, is required to produce a "unit" of teaching of 10-12 minutes duration. Each unit is to be taught to a group of about six children in such a way as to practise the skills in which he has shown weakness. The students will each prepare eight units of micro-teaching in the course of the two weeks that are assigned to the micro-teaching programme. These units are recorded in the college's television studio, where the children, who are brought in by coach, show few inhibitions about the unusual environment in which they are taught. The cameras are unmanned.

In each case, the supervisor watches the recording in the control room and suggests shots to the producer who cuts between the unmanned cameras as necessary. After the recording of each unit, the supervisor goes with the student into a viewing room and they watch, together, the student's performance with the group of children. They analyse and discuss critically what they see and decide on possible improvements. During this process another student and supervisor take their place in the studio for another unit. The first student now re-teaches the same unit with a new group of children in a nearby classroom, again observed by the supervisor, but without being recorded on videotape.

Although this technique has not been found suitable for students with severe personality defects, it was useful in the case of these students, all of whom showed an improvement at the end of the micro-teaching programme. It would not have been possible without an acceptance by the students of the need for this extra help and without, also, the enthusiasm of the staff concerned.

Production. The production skills involved are not very great, but microteaching on any scale requires considerable organizational ability in planning the programme, which entails a large number of recordings, many supervisors, students and groups of children brought into the college as well as replays, re-teaching and the documentation of the progress of each student.

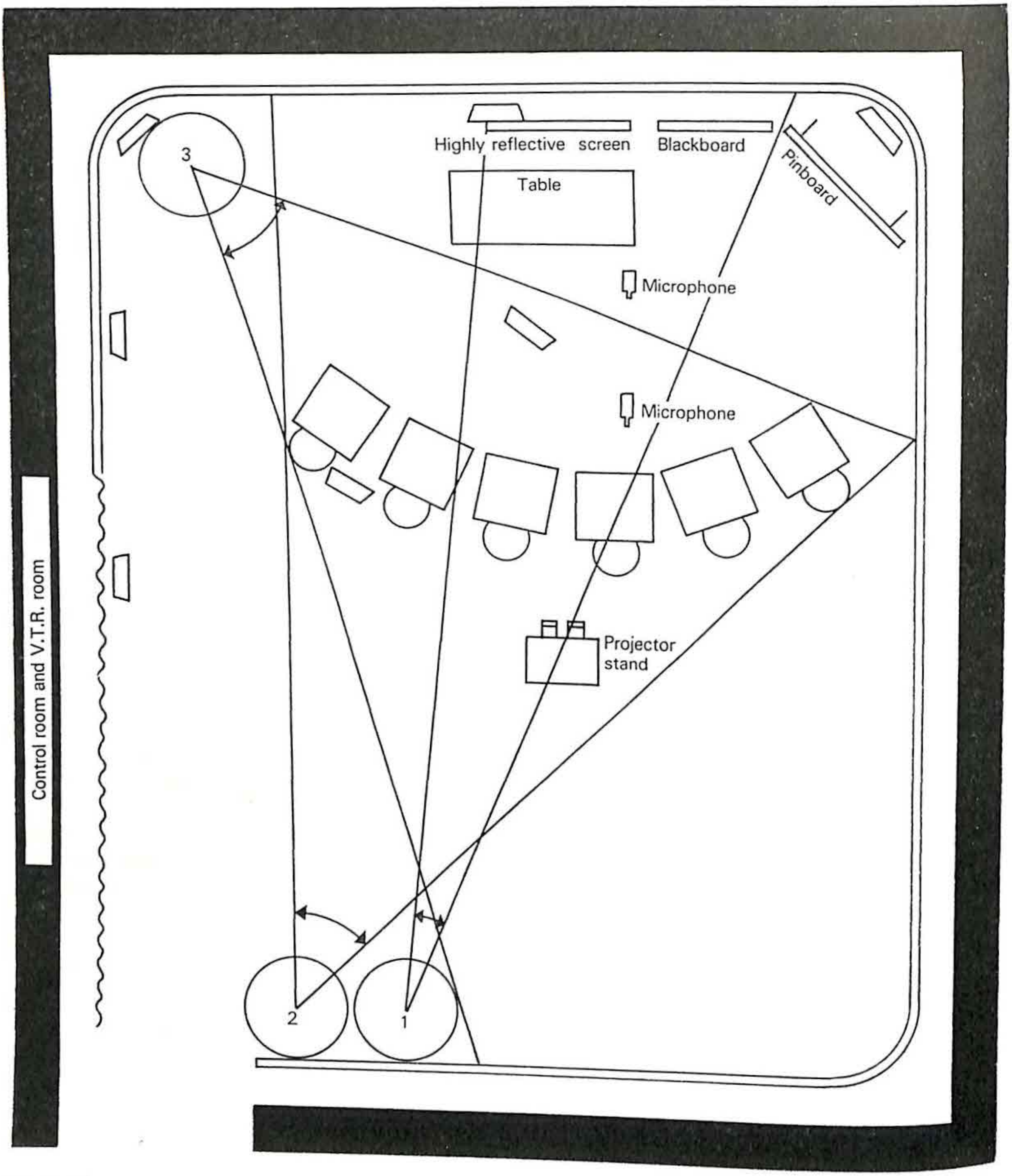
The studio is prepared as in Figure 51. The cameras are unmanned, but adequately cover the work in progress.

Camera 1 shows the student-teacher over the heads of some children and also the blackboard and projection screen which some students used.

Camera 2 gives a wide-angle shot of the whole group, also from behind the children.

Camera 3 shows the children from the front.

Sound coverage consists of providing the student-teacher with a lanyard microphone around his neck, which allows him to move freely in the studio. The children's speech is picked up by two condenser microphones suspended from the lighting grid.



⏢ Quartz iodine lamps with diffusers

Cameras (all unmanned): 1, Variable focal length lens 2, Wide-angle 3, Wide-angle

FIG. 51. *Micro-teaching layout.*

Lights—conventional studio lighting is not used because it is felt that this would produce too much glare for the children, so the group is lit by nine quartz iodine soft-lights fitted with diffusers.

Cutting. The supervisor advises on the selection of shots.

Case study 6

A lecturer in physics wants to prepare learning materials for the use of students in laboratories in such a way that the students can, on their own, work through instructions on the use of equipment required for experiments before they actually start using it. The equipment whose operation the students are required to learn is complicated and has to be set up carefully. It involves wiring, setting up and the taking of readings, all of which involve movement. Television is suggested as a suitable medium by the college's producer.

Production. A number of cameras and careful lighting are required to show the use of the apparatus, so the television studio is chosen as the place where the recording is made.

Several stages are involved in the learning process and these are worked out by the physics lecturer while the producer plans the cameras on which he will take the various shots. A formal script is not prepared, but the stages in the process are written down, together with the cameras to be used. The cameramen (who are students) are shown how to use the cameras and briefed as to their individual shots.

The lecturer, in the studio, *ad-libs* during the recording, but keeps to the previously agreed sequence in using the apparatus. The producer does the vision-mixing in the control room and follows closely what is happening in the studio. Part of the equipment has to be in a darkened area of the studio because it splits light into a spectrum. Black drapes are used to isolate this part of the apparatus from the part which is in the lighted area.

Utilization. The recording is transferred to a videocassette and placed in the physics laboratory with the apparatus itself, together with a videocassette playback unit and a viewing monitor. A simple instruction sheet tells the student how to insert and play back the videocassette. If the student is unclear about any point, he can spool back the tape and play it again. In the laboratory there are a number of other videocassettes dealing with the use of other apparatus, and these self-instructional materials are played by other students as required. The lecturer is free to pay individual attention to what the students are doing and to question them about their grasp of the principles involved.

Case study 7

A history teacher wants to show his primary school class some aspects of life in a town, 400 years ago. The town is a considerable distance from his school and a visit by all the children is not practicable. He uses a battery portable television kit consisting of a camera with built-in microphone, while slung from his shoulder is a battery-operated videotape recorder using half-inch tape.

Production. The teacher has researched the ways of life and in particular the industries which flourished in the town during the period he is studying with his class. Some of the buildings from this period are still standing, such as a monastery and working places. He makes recordings of these buildings and adds his own commentary as he does so.

Next, he visits a museum which actually occupies one of these old buildings and videotapes a number of the exhibits, plus an interview with the keeper of one section of the museum. This will provide his class with specialized information which he does not possess and the exhibits themselves will illustrate the interview.

The addition of multi-media programming

Television is not, in one sense, a single medium. It has the properties of a multimedia channel of communication, permitting a whole range of other media such as speech, demonstration, photographs, film, graphics or music recordings to be integrated into an effective whole. The remaining case studies provide instances of production techniques involving this capacity.

Case study 8

A teacher-training college is conscious of difficulties in bridging the gap which undoubtedly exists between the theory of education and its practice.

One method of doing so is to place student-teachers as observers in school classrooms, but this suffers from serious limitations. First, there is a limit to the number of trainee teachers who can be accommodated at the back of a classroom, and in any case their viewpoint will be constrained by the physical position of the students. Even more serious is the disadvantage that what they will observe is unpredictable and cannot be discussed adequately with their supervisor from the college because he was not there to see it. What is more, there is no guarantee that the worthwhile educational principles which emerge from the lesson can be repeated for other students to see.

In an attempt to overcome these problems, the college uses a mobile closed-circuit television unit which can visit any school for the purpose of recording selected lesson material and methods with a view to showing them to considerable numbers of students back at the college and directing their observation of the lesson. The lesson which is to be observed in this instance is in the area of integrated humanities and the subject relates to the period between the two world wars.

A lecturer from the teacher-training college has previously been in contact with the school-teacher, who has an enthusiastic and innovative approach to the teaching of this subject-matter and who has agreed to the recording of a lesson. A visit to the school is agreed upon by the lecturer and a producer and an engineer from the unit, to take place one week before the recording will be made. This meeting has three purposes—to familiarize the producer with the objectives and development of the lesson; to allow the engineer to resolve technical problems, such as access, power supply, camera and microphone positions, daylight intensity and the like; and to give the teacher enough idea of the television process to enable him to ensure an acceptable performance from the point of view of the medium.

On the day of the recording, the engineer and a camera operator/driver arrive and set up the two cameras, one of which will permanently show a wide-angle shot of the classroom, facing the front of the room. The other will be manned and will move on a tripod, taking a planned sequence of shots. The children come in, and the producer explains the situation to them and gives them the opportunity of having a good look at the equipment.

The engineer takes up his position in a van fitted out as a small mobile control room to which the cameras and microphones are cabled. He operates sound levels, camera control units and the videotape recorder. The producer selects the pictures which he previews on monitors and directs the cameraman who hears him through earphones.

The recording lasts 56 minutes and all agree that much of it is not necessary for their purposes: They eventually decide to use one part of the recording (at the beginning of the tape) lasting 12 minutes, and another, towards the end, lasting some 8 minutes. They have previously discussed the possibilities of asking the teacher into the studio to discuss his lesson with some students who will (hopefully) raise the kind of questions that other students would like to ask.

They plan a "running order" for the finished programme as follows:

Item	Source	Description	Duration
1	Cam. 2	Opening caption, grams	0′ 10″
2	Cam. 3	Lecturer: introduction	3′ 00″
3	VTR	Insert I	11′ 50″
4	Cam. 3	Lecturer: link to II	1′ 30″
5	VTR	Insert II	8′ 02″
6	Cam. 3	Lecturer: link to interview	0′ 45″
7	Cam. 1, 2, 3	Interview with teacher	5′ 30″
8	Cam. 3	Lecturer: closes	2′ 00″
9	Cam. 2	Closing caption	0′ 15″
			33′ 02″

The graphics are made, the teacher and students are brought into the studio and the programme finally recorded on to a new videotape. It is shown to some 300 students in the current academic year, viewing in group of thirty.

At the same time as the final recording on to 1-in videotape is made, the programme is also recorded on to a videocassette, using ¾-inch tape. This cassette is made available for any students to see by their own operation of the videocassette player in the college's media library.

Chapter 16

Community media

Frances Berrigan

What are community media?

The final chapter deals with a new, but highly significant trend—the emergence of community media. Community media operate at all levels, and in all media formats, but their common characteristic is that they are trying to overcome the disabilities of the mass media which have been mentioned so frequently: the fact that they must try, on most occasions, to be all things to all men, without possibility of intervention, feedback or participation. Earlier chapters have shown how co-ordinated planning can help overcome some of these disadvantages, by framing clear objectives and drawing up precise audience profiles, but this is a much more difficult task in the field of adult or community education. In recent years, however, new attempts have been made to resolve the problem, working partly through an extension of media technology, but also partly by freeing the structures of media production services.

Two main developments have assisted the growth of interest in community media, one ideological, the other technological. From the ideological point of view, a body of thought has grown up within and outside the media, insisting that programmes should reflect the interests of the communities they serve more closely. Media critics researchers and some professional broadcasters have pressed for a situation where the audience can become more than the "passive" receivers that they traditionally have been. There is a call for the media to become more democratic, to open their doors to a wider range of opinion about the types of material they transmit, for them to become a platform for public debate, and a means whereby the community voice can be heard.

But the media producer who wants to serve the interests of a community more closely is faced with a number of problems. On the one hand, he is working in a mass medium, which is supposed to appeal to a wide public. At the same time, he wants to identify the needs of particular sections of that audience and to create more personalized media materials. This is where the technological developments of the last ten years are most relevant. The growth of local radio stations, of local television stations, of cable television linked to smaller communities, the emergence of the video-cassette, the video disc and the portable videorecorder have meant that broadcasting structures can be modified to cater for the tastes of more clearly defined communities, and they also mean that the technical problems associated with audience participation can be to some extent overcome. As broadcast structures become more flexible, so they too, can respond more quickly to audience demands. As the technology becomes more sophisticated, and easier to manipulate, so the interested amateur has a greater opportunity to work with the tools of the media themselves.

But for the producer there is still the question of how to go about his new task. In fact, there are many possibilities open, but such approaches are very often dictated by the internal structures of the organization from which he is working. At the national level, as some of the examples later in this chapter will show, it is easier for a producer to select a particular section of the community or even a type of community with which to work; this means that he produces a series designed to appeal to a minority group with homogeneous interests and attitudes, and works closely with that community to find out what it is that they want to know, or to say, about their situation. The community here may refer to a special group or workers in problem situations or people in isolated environments. The producer will try to create materials which serve their needs more keenly than has been done previously, or he may, by working with them, help to present their case to the nation in the way which they want it presented. Another approach is to invite groups or individuals to make their own programmes, either to present a point of view, or simply to express themselves through radio or television. Examples of both of these methods of working are given below.

At the local level, there are greater possibilities, and greater challenges. Ideally, local radio and television are able to offer a range of programming which reflects the life of the parent community. In this sense, the local service complements the national output, because it makes more particular those broader themes treated for a mass audience. Local stations can set up structures, such as advisory panels, working groups and volunteer systems whereby community interests are revealed, and whereby programmes to suit them are produced and broadcast. The local radio or television producer can become involved in the life of the community, and draw upon that knowledge and experience to make his programmes more relevant. He can invite particular sections of the community to work with him on series, or simply to suggest ideas for programmes.

The range therefore depends upon environment, as well as upon the medium. In what follows, it will become clear that both radio and television have their place in extending the community principle, but the degree and particularity of that extension will depend upon just how largely the "community" is drawn.

Radio

For many years now, radio programming has to some extent been "participatory", in such programmes as *Any Questions* or *Listener's Letters,* which reflect audience preferences and queries. But, putting aside the question of editorial intervention in these programmes, participation is still at a remove; selected members of an audience put questions to a panel, or letters are read out over the air and comments invited. There is no direct interface. One of the first formats to introduce a more direct involvement of the audience was therefore the "phone-in" programme.

The phone-in

The "phone-in" programme, based upon exchanges between the listener and the broadcast studio, is perhaps the simplest way in which the public can be involved in programming. While it appears to be a natural development from the "listener's letters" type of programme, the preparation behind it, both from a technical and a production point of view, is quite complex. In the first place, it is not entirely within the hands of the broadcast organization to set up such programmes. The telephone system of any country is usually installed and operated by a government or private body (the PTT, Telecoms or the Post Office), which is responsible for the whole of the telecommunications system. If a telephone call is to be slotted into a broadcast programme, the telecommunications authority has to be consulted. More than that, the body which operates the system has the final say as to whether such programmes can go ahead. On the one hand, there are technical considerations (can the technical infrastructure stand the extra strains placed upon it by numerous calls being made to one number? Will the equipment become overloaded, and what does this mean to the telephone authorities in terms of staff and maintenance work?) Equally, there are political considerations. The government bodies which are concerned with information may not feel that the time is right to allow every member of the audience free access to the air. Another even more basic question to be asked is: who has a telephone? Are there enough private telephones to make such programmes worth while?

However, if all these points are allowed for, it is simple to acquire equipment which makes the programmes run smoothly. The key to the amplification of the caller's voice lies in a unit called a "Constant Volume Speech Amplifier", through which all incoming calls are channelled. This unit modifies the level of the caller's voice, and creates a "clean feed" from the telephone line. This means that, with the incoming call passing through a telephone balancing unit, and the microphone of the broadcaster turned to a low level, both caller and presenter are heard speaking at the same level. Usually, the voice of the presenter from the studio passes through a compressor unit, which ensures that the studio voice is constant. Another sophistication is for the voice of the caller and that of the presenter to pass through different channels on the operating panel. This means, in effect, that the broadcaster can speak over the caller if needed so that ultimately he has control of what the listener hears at home. What happens when people ring in? One number is given, and the postal authorities can provide a "key and lamp unit" with up to ten lines, all of which are linked to this number. When the call comes through, it is answered by the producer in the operation room, or directly by the studio presenter. The "key and lamp unit" can hold the calls until the presenter is ready to take them, and people ringing in are advised to turn down their radio sets at home, so as to prevent howl-round. Just before they come on to the programme, they receive a programme feed through their own receiver. The studio presenter has a duplicate "key and lamp unit" beside him, so that either he can be fed the call by the panel operator, or he can flick a switch and take the call directly. He can also cut the caller off, if he so wishes.

Some broadcast stations build in a delay, so that they can monitor the call slightly in advance. Unfortunately, no really effective system has yet been devised which will do this simply; systems available commercially are based on the use of two recording machines, one of which plays a cartridge "jingle" for 10 seconds. However, experiments in progress with standard equipment should soon make it possible to achieve a 5-second delay less expensively.

None the less, it is still true that what the home audience hears is metallic telephone quality. Engineers often find it hard to accept that this quality should be broadcast at all, and news reports via the telephone are still limited to about 2 minutes. But there is a difference between using the telephone in a general programme and using it as the basis for a "phone-in" programme, which is simply a matter of expectation and convention. Telephone programmes are announced and described as such, so that the listener expects to hear telephone quality. Evidence is that this convention is acceptable.

The attraction of phone-in programmes for the listener seems to lie in the fact that the incoming calls are broadcast, so people can hear their own voices on the air, and can be heard by friends. In many cases, the listener has the chance to talk to a favourite personality, or to question a member of Parliament directly, or a decision-maker in his area. The programme can also be used as a source of information, where people can talk to a medical specialist, a psychiatrist or a gynaecologist.

Another feature of the "phone-in" is that it is usually a "live" broadcast. While audiences can be invited to ring in and record their questions on a certain day, or within a certain period of time, this presents production difficulties, and the results are less spontaneous.

However, some successful series of telephone programmes do give people the opportunity to ring in several hours before the programme. Their question or comment is noted, and they are then rung back while the programme is on the air; this gives the producer a chance to structure the contents, so that a logical and coherent argument can be developed. It also ensures that there are enough calls at the beginning of the programme to stimulate discussion.

There are a number of alternative operational procedures for the "phone-in", which depend upon production resources as well as the style and contents of the programme. The most simple method is for calls to be routed directly to the studio, where there is a presenter, or a presenter plus a number of guests or a discussion group. Each person at the receiving end wears head-phones, so that he or she can hear the caller directly, and both the questions asked and the replies are broadcast.

Direct caller-studio productions do work well, but the more usual technique is for all incoming calls to be routed through the control room, or a separate area, where a number of lines are open, and where the producer or a group of assistants can talk with the listener before they go on the air. This is often technically the best method of operation, and it also means that people are not kept waiting on the end of a line not knowing whether or not they will be fed into the programme. It has advantages from the production point of view too, as it allows the presentation to be better structured.

Participation in making programmes

Participation in the making of programmes for radio by community groups is the next step in community involvement. What is generally meant by this form of participation is that the technical know-how is provided by the professional media producers, while the content is decided by the community group. This involves much more, however, than just giving the audience the chance to say what they would like to hear on radio. It means that, through selection or simply "first come, first served" arrangements, groups or individuals are given a certain amount of air time which they can choose to fill in whichever way they want. While the expertise is available, the group does not have to make use of it, nor is it obliged to take up suggestions from the professionals.

Naturally enough, there are very few examples of broadcasting organizations which do not have some selection procedure, and the result will be better if there are some elements of organization provided by the station. For example, if groups are invited to apply for air time, it is useful to have some form which can be completed with a few basic details about the aims and intentions of the programme-makers. It is as well to know how many people intend to take part in the programme, and the kind of format they have in mind. (This is not merely useful as a record, but it can help both the media staff and the group itself. For example, people who are inexperienced in radio work often do not realize how the studio will be arranged. They may decide to mount a discussion, and arrive with twenty guests, all of whom expect to take part.)

Assuming that some basic information about the group is available, there are two ways in which the radio producer assigned to the programme can behave. He can either act simply as a booking agent, and tell the community representatives about physical facilities, the number of microphones and the amount of air-time, or he can act as technical producer and co-ordinator. The latter means holding meetings several weeks in advance to explain the possibilities of the medium, and even making suggestions about alternative ways in which the programme may be structured, always without foisting his own ideas upon the group.

If the latter course is followed, and the series is a regular event, broadcast each week or each month with a different group, a regular producer needs to be chosen to do the work. If the series is weekly, about two days of production time should be enough. Most of the programmes are likely to be in the form of discussions, but even these can be improved by a little preparation.

During the initial talks between producer/co-ordinator and group, it should be possible to list the points which are going to be made, and the speakers who are going to make them. The producer might feel that the programme would be more forceful if the opposite point of view were represented, and can suggest this. He might also discover that a great deal of factual information will be included and ask the group to clarify or simplify this material. He may point out that it is better to use a number of voices to present the programme, rather than one, or he may suggest that the group prepare some actuality material, in the form of interviews, or "vox pops", to make the presentation more lively. Members of the group may like to carry out the interviews themselves, or they may prefer the producer to arrange for them to be done. Any of these ideas will help to enliven the programme, but the producer must be able to accept that the choice is with the participants. It is possible that such a series will get off to a doubtful start, but people learn quickly, and later programmes are likely to reflect the experience of the early attempts and to make fewer mistakes.

Another type of community participation programme is one in which the radio producer invites several guests to an "open house", where listeners can be present in the studio to ask questions or debate local issues. A programme of this type is broadcast every Saturday afternoon in the Netherlands. There, listeners become members of the broadcasting association of their choice by payment of a subscription, and each Saturday, new members of one company are invited to the station to take part in a live discussion. Politicians, public figures and decision-makers are invited, and the programme consists of exchanges between members, professional presenters and the guests. Such a structure sounds uninteresting, but what makes it refreshing and informal is the fact that the studio reserved for the programme resembles a cafe or restaurant. Wooden barrels serve as tables, with country-style benches and stools; the tables are covered with cloths, and the walls are curtained. Before and during the programme, refreshments are served, and microphones are placed so that members do not have to leave their seats to make a point. The background noise, plus the informality of the decor and the fact that people can relax with a drink, removes any sense of a stilted atmosphere.

Access to the media

Both forms of community involvement described so far mean that listeners have access to a different kind of programming, and hear the views of a wider range of people than would otherwise be possible. But one step further is to give audiences access to media tools, and invite them to produce programmes technically as well as to participate in decisions about content.

In radio terms, this means that people will choose their own topics, the order in which the content is presented, record interviews, edit the tapes, select the music and write the scripts.

There are two possible approaches, which are perhaps best described through examples of what has already been tried in European countries.

In Denmark, the national broadcasting organization has set up a "Radio Workshop" with its own production and editing facilities. The idea is to offer free access both to the technical equipment for the making of programmes and to air-time (as most of the programmes produced in this way are broadcast over the second network).

Anyone can apply to make a radio programme and, in doing so, becomes a member of the workshop. Being a member means that the individual can vote for or be elected to the day-to-day committee, which decides how the workshop is run and which programme proposals are accepted. When a proposal is agreed, one of the three full-time professional production staff members is assigned to work with the individual or the group which made the proposal.

The role of the producer is to help members produce their programmes, which means discussing content, giving instruction in the use of the tape recorder and editing, arranging for studios and other facilities. What the producer does not do is produce the programme himself. He is simply there to help where he can, and to show members how to get the best out of the equipment.

Most of the programmes produced at the workshop are features; a series of interviews, recorded at length, then heavily edited, woven around linking commentary and music. One example was a feature made by a city tramp, who had noticed, in his wanderings, how much interesting vegetation there was to be seen in urban areas. Another programme was made by a woman who had been entitled to an abortion under the law, but who wanted to express her resentment of the treatment she felt she had received from the medical and social services.

Each person or group selected by the committee is allocated a specific amount of production time and the use of recording and editing facilities; although they are not given a fixed sum of money they are reimbursed for expenses. When the programmes are complete, they are reviewed by the committee, which decides which broadcast slot they best suit. Programmes are then sent to that department to be heard by those in charge for a final audition. About 70 per cent of all productions are given air time, and they are broadcast, the makers receive a full professional fee for their work.

The second approach is when a community group is involved in the making of a series of programmes on one topic. For instance, a group of tenants in a particular area may want to make several programmes about community action, or to give publicity to the means through which groups can organize themselves to improve their circumstances. One example of this type of production was a series of twenty broadcasts made for London schools on the topic "Black Studies". This was a series for secondary-school students whose aim was to provide a cultural, historical and social background for both black and white students about the heritage of black people. There was a great deal of concern in the schools about the fact that children from the West Indies, from parts of Asia and Africa, or the children of parents from these countries, had no information about their origins, and therefore lacked a sense of identity.

As is usual with educational radio programming, teacher-advisers were consulted, and it was realized that this was a kind of project which called for closer liaison and co-operation than usual. One of the reasons was the fact that teachers were already working in this area, devising a course, and it was felt that they could make a vital contribution. The other consideration was that the educational production staff had no first-hand experience of the problems to offer. The structure which emerged was based upon bringing together teachers working in the field, representatives from the Race Relations Board, community workers and other people who had some direct knowledge; it was proposed that this group decide the topics, the order of content, the material for the programmes, and prepare the scripts. The producers saw themselves as co-ordinators, and as technical assistants, and were ready to help in any way the group wanted. They invited members of the team to present the programmes as well as to make recordings and choose music and effects. The larger group then broke down into smaller working teams of two or three people, who volunteered to prepare one or two of the programmes, and to collect and advise upon the pictorial and printed support material. In this example, several of the groups participated actively from the original meeting to the recording. Others elected to provide the factual material, but to leave the production staff to develop a programme format.

Perhaps the main problem for a producer who chooses to work in this way is in finding a new role. While being careful to encourage and advise on technical aspects, he knows that, ultimately, responsibility for the series rests with him. He wants to broadcast programmes of good technical and even artistic quality, as well as programmes with new and relevant content. Working with groups of this size can be difficult, and personal relationships and conflicts develop which can complicate the process. Time is taken up in lengthy discussion, and in accomodating different attitudes and points of view, and for the producer who is used to working to a tight schedule there are frustrations. However, on balance, the originality of the material and the breakaway from traditional styles and values does bring a new and refreshing approach which is well worth the effort.

Television

Television, because of its technical complexities, has long been thought of as "best left to the professionals". But the new technologies (such as the videocassette, the portable video camera and recorder), as well as the growing flexibility of local and cable television structures, have brought about some changes. It is now possible for non-professionals to be involved in the actual making of film and video materials for distribution by television channels, even though decisions about how far the layman is consulted or participates are still in the hands of the specialist. Unlike radio, therefore, much of the discussion about "community television" revolves around the technical quality of the final product. It is still, despite simplifications, less easy for the amateur to learn the basics about the medium. As a result those in control of television distribution systems, local or national, tend to evolve house rules about the accessibility of the medium as they go along. How much community participation results often depends upon the personality of those in charge, and in their attitude towards their station's output. Community programming in television terms will therefore depend upon the flexibility of the structures which have been set up to allow for, or encourage, its growth. It will vary depending upon whether the work is being done as part of the output of a national network, a local or regional station, a cable television company which serves a small community, or simply involves the making of video programmes which are not necessarily for television distribution. For this reason, this section on community programming for television which follows will work from the macro- to the micro-situation.

National broadcasting

One of the ways in which national broadcasting organizations have tried to broaden the opportunities for community views to be represented is to invite groups and individuals to apply for air time. The understanding is that those people who apply may want to put across their own point of view on a subject to a wider public, or they may simply want to make a programme about something which interests them. If this opportunity is offered, there has to be a structure to cater for it, as is the case which a BBC programme, currently running in the United Kingdom. What is offered is theoretically access to the distribution system of the BBC for anyone who wants to make use of it. Groups write in requesting air-time, and are sent a form to complete with a few statements about their aims and ideas. Although the programme producers like to feel that they never say "no" to requests for space, it is difficult for them to say "yes" to everyone who applies. Since the programmes were first broadcast in 1973, a large wall-board in the central production office has been filled with 300-400 names and addresses of people wanting to make a programme, and at the rate of one programme a week (sometimes two topics are covered in the 45 minutes allowed), and with new applications constantly coming in, the backlog of requests is likely to remain at least constant.

Once the topics have been selected, a member of the production team is assigned to work with the programme makers. The role of this producer has changed since the series began; in the early days, the professional producer tried to behave something like a booking clerk, simply helping the group to bring together all that it needed to get the programme on the air, with the basic intention of interfering or influencing the participants as little as possible. If more help or advice was wanted, then the producer was willing, but this role was supposed to be passive.

However, the production role has become somewhat more active, as it is now seen to be the responsibility of the professional staff to help groups to make the "best" programme possible out of their material. An analogy is suggested with a lawyer, whom the client consults, to whom he states the facts and his interests, and asks him to use all his years of training to put the best case forward.

Even though it cannot be said that such programmes offer unlimited access to the vast resourcesof the BBC for those people who have the chance to make a programme, they do offer a full film crew and a moderate budget for filming, plus editing and assembly facilities. They provide graphic artists, a simple studio set and a studio director for the production. Occasionally, groups which have made their own video or film are able to include this in the programmes, but on the whole the BBC is offering access to resources in terms of staff and to air-time, not to the use of the production equipment itself.

A rather different series in the Netherlands began when a producer from the features department made a film about the lives, attitudes, hopes and experiences of a group of factory workers. He then invited other workers to send in their reactions to the programme, to see whether there were comparable situations. What arrived in the post was creative material—poems, essays, stories, pictures—as well as letters and notes. Some of this material was later published, but the main outcome was a new series. Workers in all types of occupation write to the programme with their grievances, and invite the production team to visit and make a film. One important aspect is that all programmes start from direct invitations from groups or individual workers. The film crew makes the programme with their help and advice, as much as possible, through the eyes of the people who made the request. There is no attempt on the part of the producer to interpret the scene other than through what the employees say, and the result is a broadcast which does present a point of view which has hitherto been rarely heard.

Another Finnish series is concerned to present the point of view of minority groups. The programmes are set up as a kind of debate, with members of the community as the participant audience. They may be workers, or small farmers, or immigrant groups, or villagers, who feel that they are not getting a fair hearing for their grievances. Usually such minority or community groups write to the producer, who then visits them to explore the situation for himself. (The process of working on the spot with the community to obtain a clear picture of their circumstances may take two or even three months from the initial contact.) For the programme itself, the community provides a list of influential people and decision-makers, to whom they would like to put questions, complaints or problems. The role of the producer is to provide the facilities of film and television, but not to draw up lists of questions or even decide who from the "ruling body" ought to be invited.

Each programme is transmitted "live" and the setting is usually a community centre or a hall. The invited guests are seated on a raised dais, while the community involved occupies the body of the room. On occasions, there have been as many as 800 people in the participatory audience, all of whom have had their say as to what the programme should cover. Often, these people assign tasks to one another—to collect statistics, to research facts, to draw up graphics, to select questions—since all this has to be done by the community itself, not by the production staff. Naturally enough, the programme is usually a confrontation process, and tempers and frustrations come to the surface. But some of the tension is skilfully alleviated by the fact that there is an element of "music-hall" built into the programme; local singers, poets, comics and performers of all kind prepare items and small sketches, which are woven into the structure. Sometimes these are satirical pieces, timed to make a point at a particular moment in the argument, but they are often simply a revival of folk humour or local culture.

Local and cable television

Local television implies a small broadcasting station serving a number of towns within a particular radius. Cable television (with wired distribution) usually serves a much smaller area, such as a town, or two or three adjacent communities. Many local stations are simply branches of national networks, and their programmes simply include news items and the occasional programme about events in the area. Much more significant from the point of view of community programming is the spread of cable television. Both in North America and in Europe cable stations have bee set up to allow for community participation and even, in some cases to depend upon it for programme output.

Whatever the aims of the providers of the cable service, it is true to say that participation will never come about automatically. It has to be worked for, and the organizational patterns within the cable stations have to be such that they encourage community use of the medium to develop.

Cable stations are frequently operated by commercial companies. What they set out to do is to provide a service to the community through such appeals as offering a wider choice of programme channels, or better-quality reception; community involvement is often a minor consideration. However, if cable licences are granted with the specific intention of allowing members of the public to be active in production, there are ways in which both the commercial provider of the service, and the groups which want or need access, can be satisfied. One method which has been tried, most notably in North America, is for the cable operator to make available a "free access" channel. This is a channel specially reserved for community groups of individuals to transmit programmes they have made, using either the technical equipment provided by the operator, or publicly owned hardware. The problem with this method is that there is often no built-in infrastructure to encourage and promote the use of the medium. One such station operates with only a technical assistant to hand out and demonstrate the use of the media tools, and it is not surprising if, in this situation, interest both in production and in the completed programmes soon starts to decline.

The "free access" channel is developed to a fuller extent when a cable station is owned by the community itself, with grants from the local government body, supplemented by the education and social service organizations. But the same proviso applies. There must be a structure to stimulate, promote and educate the community in the use of the medium, otherwise it will be underused.

In the first place, there should be both technical staff available to train and guide people in the use of television, and production staff to promote its use. The production staff might consist only of one producer and a secretarial assistant, and their task would be to make sure that there is a spread of information about the availability of the medium for likely programme makers, to run courses for groups and individuals, to set up training sessions for professional and minority groups (such as teachers and social workers or young people and housewives), and to demonstrate the ways in which the medium can be employed. The production nucleus can also arrange bookings for the equipment, and take part in videotaping sessions where needed. A great deal of effort on the part of the organizing producer will be required in the early stages, but there are ways in which the momentum which has been built up can become self-perpetuating.

The first possibility is for the local management to invite representatives of community organizations to sit on a committee, the purpose of which is to put forward programme ideas, to provide some sort of feedback about programming, and to reflect the wishes and needs of the groups to which the individual representatives belong. This is the same kind of liaison structure often established for national or regional television, and there can be separate bodies for education, for community, for immigrants, for sport and leisure and so on, or one body to encompass them all.

While the idea is not, in itself, innovatory, it is true that, if the relationship between management and the advisory body is strong, the type of programming which emerges does reflect a wider range of local opinion. At the other end of the scale, there is the *ad hoc* involvement of local people in the actual running of the station. Advertisements in the local press for volunteer secretaries, script assistants, programme presenters and cameramen (or women) usually bring a healthy and enthusiastic response. The volunteers can be given training sessions for more technical tasks, and if there are many of them, they can be asked to work on a rota basis, so that as many people as possible have the opportunity to operate equipment and help with research.

However, if programme ideas are to come from advisory panels, they must understand television possibilities, which means that some short introductory or training session should be organized. They should have the chance to meet producers, to see them at work, and to appreciate some of the technical difficulties and constraints on production. One way of organizing this is to offer small groups the chance to work with a producer on a particular topic, right from the research stage to production in the studio. This can lead to more active involvement, and for some, will serve as a preliminary training ground.

Conscious effort to introduce the community to the business of making their own television programmes is a further step. In one station, for example, there are no professional production staff at all, but a station manager who works on a day-to-day basis, arranging bookings for groups or individuals who want to make programmes. A number of committees have been set up: two for education, two for music programmes, one for community programmes and another for religious programmes. These committees put forward programme ideas, and their members produce the material, with technical help from the station, and organizational help from the manager. In another station, courses are run by a member of the staff, and by this means new people are found who want to make programmes themselves. There is also an opportunity for individuals to simply walk in through the door, put up a programme idea, and start to make the programme. They are shown how to use the portable video equipment if they want to, and arrangements are made for them to borrow whatever they need. They can also ask for a member of staff to be with them if they would like to have assistance.

The programmes which emerge from this kind of co-operation are varied. Some are documentaries made on portable video equipment, completely devised and taped by community groups. Others are studio discussions or interviews, making use of captions and short film or video sequences. In many cases, studio production (vision mixing) is done by the professional staff, but where the facilities have been designed for one-man operation, there is no reason why this cannot be done by amateurs.

The programmes made in this way, by the community vary as enormously in content as they do in technique. Some deal with local problems, such as housing schemes, education, social welfare. There are programmes about new services and facilities. Other programmes are made by pressure groups who want to gather support for some specific campaign. Minority groups such as hobbyists, as well as minority language and religious groups, produce for their particular section of the community. Then, there are information programmes of all kinds (what's going on in local theatres and cinemas, clubs and societies). Information programmes about the social services are produced and presented by staff members, and similar programmes are made by teachers for parents, or by local doctors on community services the working of health schemes and hospital procedures. All this sounds rather intense, but there will also be a great deal of local entertainment which can be televised, and an opportunity for local groups to perform. There is almost always a place for programmes covering local sporting events, and it is usually easy enough to find sporting enthusiasts who will take over the entire responsibility for sports coverage. One of the advantages of the local cable station is that it can give the opportunity for a community dialogue to develop. A station which invites groups to make programmes will inevitably find that many of the points of view presented are one-sided. While this is not necessarily bad, the medium can be used to find the answers to questions and the solutions to local problems, if it is treated properly.

There is no reason why the whole dialogue process between the community and its leaders cannot be televised, even if the changes stipulated take place over weeks and months. The flexibility of cable television can prevent it from falling into the same trap as the national media, where a topic is taken up when it is "hot news", then dropped as soon as some other event supersedes.

As was mentioned earlier in this chapter, the technical complexity of the medium does make it more difficult for the amateur to produce a programme which is acceptable technically, and in terms of content, to a wider audience. For this reason, there is a great deal of debate about "professional standards" and much of this debate is centred around the output of community cable stations.

If it is accepted that the main purpose of television is communication, then there is a strong argument for ensuring that those television products which are transmitted are viewable and comprehensible. In the simplest terms, the picture and sound quality should be such that they can be received in the home of the audience. It is, however, less easy to lay down "professional" standards for the contents of community programming, or the ways in which such contents are presented or linked together, how the pictures are composed, and the studio arranged. This can only be arrived at empirically, and it will vary in each environment.

One of the ways in which some of the amateur/professional conflicts can be resolved is to set up structures which enable people to use the medium to express themselves, and to communicate at the community level, but without the need to create programmes which will be compared with nationally, or regionally, transmitted materials. Here, we arrive at the use of portable video equipment by the layman.

Video programming

Portable video equipment, simple to operate and produced by most of the known manufacturers, is apparently here to stay. Battery-operated video recorders and cameras capable of instant playback and tape reuse are now on the market to be bought by any individual or group which can afford them. They use ¼-inch, or ½-inch tape; each can be used about fifty times; and there are ½-inch and 1-inch editing and assembly decks. The problem with video equipment, however, is that there is too much of it. Recordings made on one make of machine cannot often be played back on another make without distortion, and, in some cases not at all. Editing ½-inch tape is possible, but the results are not very successful, and without well maintained and suitable machinery, the transfer of ½-inch material to 1-inch format for editing, or to link with studio tape, is precarious. But there is a distinct place for video, and many of the problems mentioned above are coming to light as the technology is more widely used. As the hardware is refined, as the people using the equipment come to know it better, and as the language of video is more clearly understood, it should become a valuable tool for community dialogue.

It is true that anyone, child or adult, can learn how to use a portable video camera in about 30 minutes. It is also true that, because the machinery has instant playback, the "producer" can monitor his progress as he goes along, as can the people taking part in the taping. These two factors, combined which a third (that if the producer or his subjects do not like the picture or the sounds they can erase and tape again, just as with sound tape) already reflect some of the reasons why video has been greeted so enthusiastically as a tool for community participation. However, it is often not appreciated that portable video equipment, like all electronic hardware, is sensitive. It has to be handled with care; users must be taught how to treat it properly and to keep the camera and the recording heads clean. The equipment has to be carefully and protectively stored when not in use, and it will be less likely to let the user down on the day if it is carried about in specially designed containers. Nevertheless, its advantages still outweigh its disadvantages, even if one were to judge only from the number of its active followers. Small groups using video have sprung up all over North America and Europe, and it has been used recently for community education projects in parts of the developing world. Some of the functions of video materials are obvious. There is the simple fact that it can be used to record or document a local event. Video can be used by a group which wants to present information to another section of the community (as when it is used by a tenants' association to tape the cause of grievances about housing conditions, and show the results to the body responsible). It can be used to present a collective point of view, or an argument, from a community group to those in authority. It has a positive advantage over traditional print media in that skills of reading and writing are not required; therefore, it can provide a means by which a community group can present its case graphically and forcefully, with pictures to accompany the words, better than it could possibly do on paper.

Another use for video is simply for it to inform people about what is going on. It can be a means by which information is exchanged within the community, or from one community to another. At the simplest level, a public meeting which makes use of video to present information is likely to draw larger audiences and, because of the additional informality with which it is presented, can help elicit a response from those attending. Other community groups have used video to explore their own situation, to draw up a kind of visual profile of their area, its needs and limitations, and to collect views from a wide range of people on problems and possible solutions. In this way, video is something of an instrument of research, where small taped sections are collected and analysed so that people develop a clearer idea of their physical and social circumstances.

Each of the uses of video described so far envisages it as a medium to be used for small group work, and without linkage to a distribution system (such as a cable network, or even to a regional television network). Portable video is of course used by many local television stations, but it seems to be clear that the making of video programmes, and the process of using video in the community, can be quite separate. If video is to be distributed outside the group which was involved in production, or to a wider audience which has no direct relationship with the events treated, then it has to bear some resemblance to television programmes. The programme tapes will have to be quite heavily edited; they may need to be assembled in a certain order; picture and sound quality have to be comparable with other output; the material should be arranged so that it has some kind of beginning, middle and end, and the content should be of interest to the extended audience.

But there are alternative uses. The most prolific use of video is made, at the present time, by small groups who see themselves as "community workers". They purchase the equipment, sometimes with the aid of grants from government organizations, or from cultural associations which have connexions with the media, or even from charities. The groups may work with particular sections of the community, such as racial minorities, old people, or the homeless. Their method of working is informal, and they are more or less adding video as an extra tool where they might previously have done the work in some other way. Then there are groups which have a particular desire to be associated with the medium of television (and they may also work with film). There are "video artists", who are exploring video as an art form, either alone, or as a part of multi-media expression. Most of these groups have their validity, if only because they lead ultimately to a spread of awareness and a realization of the purposes to which television and other communications media can be put.

Beyond this, there are experiments in progress which are not directly community centred. One of these involves placing video production centres in public institutions, such as local libraries, or community centres. The centre, the technical staff and the hardware, are provided by a cultural group, education authority, or a local government body. The idea is that tapes made are stored at the centre, and anyone can view them at any time, just as he might browse through a library book. The tape bank then consists of programmes made by community groups, by video artists, by individuals who want to make a point, by children or minority groups. Some such centres also retain some professionally made programmes on topics such as education, child care, the environment. These can be viewed, and follow-up tapes can be made if there is a response to them. On other occasions, where there is a topic which affects a large number of people, the centre can be used to hold meetings and to show tapes to stimulate discussion. The *raison d'être* of these centres is that they attempt to develop into a meeting place, a focal point for community activities and a clearing-house for community information.

So far, little has been said about the functions of small group work using video. This is the kind of work now being carried out in developing countries in the family-planning and community-education field, and in large urban areas with special community groups. It raises the question of the "video-animator" (the individual who brings video to the community) and the part that he or she plays in the process. Naturally enough, there will nearly always be an animator of some kind available as there has to be someone to show people how the equipment works, who even at this level is conveying the idea that video can be useful, or enjoyable, to work with. But the term "animator" has come to mean something more specialized, though it is not as yet a clearly defined role. Some of the functions of the animator can be best described in terms of what he does not do. The animator is not persuading people to make programmes; he is not inviting them to put forward their views on a particular topic; he is not trying to encourage them to use video to pressurize decision-makers.

These may of course be among the results of video availability, but they are not necessarily so, and they do not derive directly from the animation. The situation of the animator is much more passive, in that he presents a communication tool to a group, and encourages them to explore the ways in which it might be used. Yet he cannot be totally passive, because, by his very presence with the tools of communication, he is activating and influencing the group. The animator is usually an outsider. He has a special skill and he has special knowledge. Often, he is chosen to carry out the work because of his particular ability to work with people, and to give them confidence in his impartiality.

What the animator has to do, then, is to let people feel that they can use the medium in whatever way they like. The hope is that, through exploration, the members of the community will discover ways in which video can be of use to them. Certainly, they will discover things about their own community, and the animator can be present when tapes are played back to help guide the analysis of material, and to provoke discussions. Some groups have found that video helped them to identify the real roots of environmental or social grievance, simply because people were prepared to put their point of view to a camera, and because many points of view were collected and played back at a group meeting.

Working in this way with video is inevitably time-consuming. Furthermore, its outcome cannot be predicted, and this point should be emphasized. If an education authority decides that video might be useful in stimulating people to attend its evening classes, and sets the process in motion, it may unearth unpleasant truths about the community attitude not only to evening classes, but to the whole education system. But if the authorities are genuine, then even this type of clarification and identification of need can be valuable, and the end result of the video process could well be modified priorities at the highest level.

Wherever video is used (and the same is true when film is made available) the community must be free to use it without fear that there is a manipulative force in the background. When people begin to work at first hand with the media, they often discover interests and attitudes of which they were not previously aware. Any structure which is set up to encourage community participation has to allow for the strains which will be put upon it by the very freedom which it has encouraged.

Conclusion

The range of this handbook has been deliberately wide, and it is understood that the media producer will pick and choose among its contents, selecting those aspects in which he is most interested. He should also, after an initial reading, refer back whenever he needs further support, and refresh his memory of particular chapters.

It is to be hoped that the producer will, in all of this, remember the basic premise of the manual—that media are interdependent, working not only in concert with each other, but as parts of a dynamic educational process. But it is also to be hoped that, as he gains in experience, he will venture to disagree with some of its judgements, provided that he can argue through this disagreement. There are few hard and fast rules in this field; the aim of any teacher, or of any background text, should be to build up experience and confidence to a point where the lessons taught can themselves be challenged. Only in this way will the discipline develop and move forward.

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The names of contributors to particular chapters are quoted in the main text. The principal contributor is shown first, with authors of additional sections listed underneath.

Brief biographical notes are also given below.

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